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TRAVELLER®

THE DESERT ENVIRONMENT

by William H. Keith, Jr.

Gamelords, Ltd.

THE DESERT ENVIRONMENT

A Supplement for Traveller®

by

by William H. Keith Jr.

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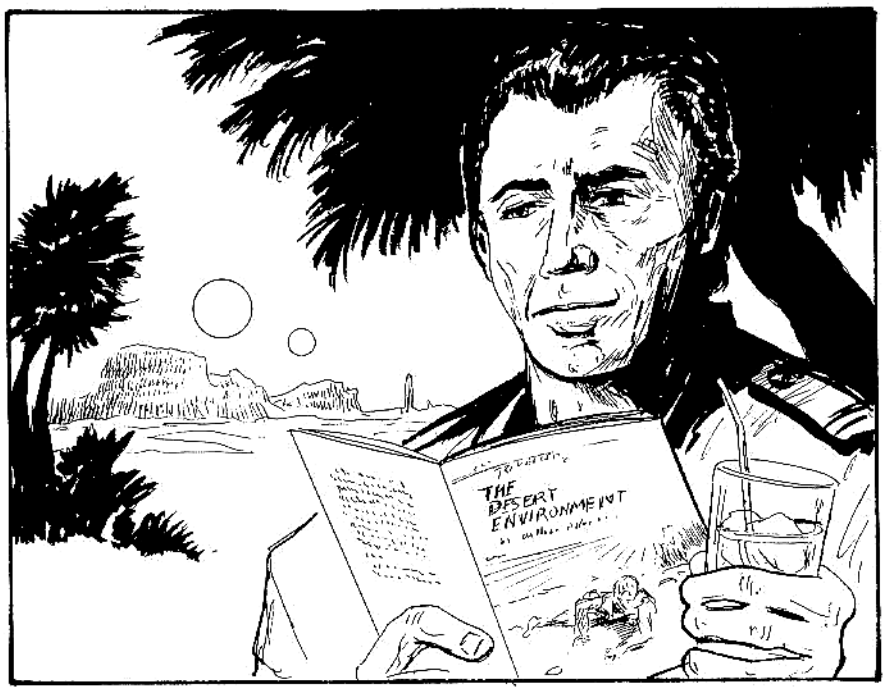
Introduction

The Desert Environment is a supplement for **Traveller** which allows the **Traveller** referee to simulate the special problems, encounters, and 'feel' of the desert for his role-playing group. This material is intended to expand and enlarge, rather than replace, the rules for **Traveller**. It provides guidelines which the **Traveller** referee may feel free to apply or reject as he chooses.

This booklet is presented in six sections. The first, Rules, gives systems and guidelines for simulating desert conditions in **Traveller** game terms. Desert Terrain gives guidelines for creating specific encounters and events which the referee may wish to incorporate into his adventures. Survival in the Desert details ways of dealing with problems in the desert in securing the necessities of life. Danger in the Desert provides descriptions and methods to handle the many difficulties facing desert travellers. Equipment describes hardware and gear which may be useful to **Travellers** in the desert. Finally, Adventures in the Desert outlines several possible adventures which the referee can develop more fully, using **Basic Traveller**, this booklet, **The Desert Environment**, and his own imagination.



Unless specifically contradicted, all normal **Traveller** rules apply. The referee may freely ignore or modify individual rules in this material to tailor it to a particular adventure or **Traveller** group. Remember, however, that changes in **one** set of rules may well affect others and upset the balance or the realism of the game.

SKILLS

A new skill has been created for use by **Traveller** characters in arid environments. Called Desert Survival, it is similar to the Survival skill described in Book 4, **Mercenary**, and represents a character's ability to find food and water, construct shelter, and travel in the desert.

Desert Survival can be a 'cascade skill' of the general Survival skill presented in Book 4, **Mercenary**, if those rules are being used. Any receipt of Survival skill can be specifically designated as Desert Survival instead. For characters with general Survival skill, two levels of Survival skill can count as one level of the more specialized Desert Survival skill.

If **Mercenary** is not in use, Desert Survival skill may be earned any time a character would normally receive +1 Endurance (in lieu of that increase). Most important, it can be bestowed upon a character if it has been specified (by the referee or the player) that the character was born and raised in a desert environment. Such a character is going to know tricks for finding water, for protecting himself from extremes of temperature, or for predicting a nasty turn in the weather.

When a **Traveller** character is being created, the player may wish to specify that he is from a desert environment. This could be a desert planet (as defined in **Basic Traveller**: a world with a hydrosphere of Ø and an atmosphere of 2+), but might also be a desert area on any planet similar to Earth (it should be remembered that earth, with its 70% hydrosphere, still has arid and semi-arid regions which add up to 30% of its total land area).

Characters coming from a desert environment will have an automatic Desert Survival skill level of 1D-2 (less than 1 = 1), which they may apply in desert survival situations. The referee may wish to reduce this skill level by 1 (less than 1 = 1) for characters attempting to apply their Desert Survival skill in deserts on worlds other than their own, especially in NPC characters from primitive, pre-spaceflight tech level worlds. This restriction reflects differences in flora, fauna, and survival lore; the differences between two separate deserts on the same world can be enormous. This survival limitation should not be applied to characters who receive Desert Survival as a cascade skill from the service.

Service-aquired skills tend to include general techniques drawn from a variety of worlds, and are applicable anywhere.

Some characters may not have been born in a desert environment, but their players may wish to argue that they spent quite a bit of time there — perhaps during a tour of duty in the Service. At the referee's discretion, these characters may be allowed a Desert Survival skill level of Ø, suggesting familiarity with basic desert survival techniques. These characters should have spent at least four years of their Service hitch on a world (i.e. not aboard ship), and they should have Intelligence 8+.

General Description	Specific Game Effects
Desert Survival — The individual is familiar with the special problems of surviving in arid and semi-arid environments.	Desert Survival skill can be used as a DM in many situations where that skill could reasonably be applied — such as in attempts to locate water or to avoid the effects of extremes of temperature, or in travel. The referee can also pass special information to any character with desert skill to direct the course of an adventure or to warn the party of danger. Thus, a character with this skill will be the first to see and recognize signs of an approaching sandstorm or of heat exhaustion in a companion character, and may be given special tips and insights by the referee.

APPLYING OTHER SKILLS

Most Traveller skills are applied normally in desert environments but some may be modified somewhat, depending on conditions and on the referee's discretion. These are listed below.

Electronics: Any die roll representing work on electronic circuits or components while they are exposed to desert sand or dust has an automatic DM-2.

Gravitics (Book 5, High Guard): Any die roll representing repairs or adjustments to grav units or devices while they are exposed to sand or dust in the desert has an automatic DM-2.

Hunting (Supplement 4, Citizens of the Imperium): Any application of Hunting skill is reduced by 1 in the desert **unless** the character also possesses a Desert Survival skill rating of 1 or better.

Mechanical: Any die roll representing attempts to repair, adjust, or build mechanical devices while exposed to desert sand or dust has an automatic DM-2.

Prospecting (Supplement 4, Citizens of the Imperium): If characters also have Desert Survival skill of 1 or better, Prospecting skill **may** (at the discretion of the referee and of the player) be interpreted as applying only to prospecting in desert environments. The character can recognize ore-bearing rock outcrops or anomalies and is able to search for mineral deposits in the desert.

Tactics: Characters unfamiliar with the desert environment may have trouble directing men in combat in the desert, with its special problems of cover, survival, and supply. Unless the character has had experience in desert conditions (Desert Survival level Ø or better), his Tactics level is reduced by 1.

Vehicle: The desert environment affects the handling of certain vehicles, as follows:

ATVs: -1 to driver's skill level in soft sand or dune areas.
Tracked vehicles: Same as ATVs.
Wheeled vehicles: -3 to driver's skill level in soft sand or dune areas, -1 in rough or rocky regions.

These effects on driving skill are eliminated if the character has Desert Survival skill of 1 or better.

Depending on the tech level of a particular world, native NPCs may possess one or more of these skills adapted to the environment in which they live. These NPCs would be expected to have Desert Survival, plus other skills without the negative DMs listed above. If, however, these NPCs leave their native environment for some reason, their skills will be reduced by 1 (or more, at the referee's discretion and depending on the particular situation).

For example, a desert-living NPC might be hired by a Traveller party for his skill in hunting — a level 2. If this NPC goes with the party to another world, however, even if they visit a desert on that planet, the NPC's Hunting skill will be reduced to 1. Types of game, hunting signs, weather, and many other factors will be vastly different on another world; in reality, there would be tremendous differences in hunting techniques, lore, and quarry between two isolated deserts on the same planet. It is at the discretion of the referee whether the skills of either player characters or NPCs should be modified if they move from one location to another on the same world, or whether conditions might be so different between two locations (either on the same or different worlds) that skills adapted to a particular environment might lose more than one level — or even become completely useless!

MOVEMENT

The basic rate of travel for Traveller characters on flat, open ground is 1000 meters in 10 minutes, or 6 kilometers per hour. The nature of the terrain the character crosses, however, can have a tremendous effect on his actual speed.

The following table gives modifiers which are multiplied by the basic distance covered in a given time to give the actual distance covered. The first part of the table gives broad types of terrain, and is based on 1-hour periods. The second portion of the table gives more localized terrain types which can be encountered in considerably less than an hour, and is based on 10-minute time periods. The referee keeps track of the cumulative effects of terrain and lets the players know how far and fast their characters have come.

The values given under Endurance Loss are also cumulative and are discussed in the following section, Loss of Endurance.

DESERT TERRAIN MOVEMENT

Terrain Type	Movement Rate Multiplier	Endurance Loss/Hour
Flat, open ground, hard-packed sand, salt or alkalai flat	x 1.00	2
Rough or rocky ground, uneven surface, loose rock	x 0.50	3
Very rugged terrain, badlands, canyon, broken lava bed	x 0.25	4
Loose sand (less than or equal to .5 meter deep)	x 0.50	4
Very soft sand (greater than .5 meter deep), dune seas	x 0.25	6
*Large boulders, area of very loose rocks or gravel	x 0.50	6 (1)
*Moderate slope (windward face of dune, or normal hill) — ascent only	x 0.50	12 (2)
*Steep slope (leeward side of dune, or steep hill) — ascent only	x 0.25	24 (4)
*Arroyo or gulch, steep sided gully — ascent and descent	x 0.50	24 (4)

* These areas take less than an hour to cross. The exact time is 1D x 10 minutes. The parenthetical number is the Endurance Loss per 10-minute period of time.

By way of an example to show the cumulative effects of travel, consider a character who sets out to cross a stretch of desert. For the first two hours of travel, the ground is flat and hard, and he travels at the basic rate of 6km per hour. In the third hour, the ground gives way to loose sand, and his movement rate is multiplied times .5, giving 3km per hour. In his fourth hour, he finds himself in very soft sand, and, after walking half an hour, he encounters a sand dune of moderate slope which he must climb. His movement for the first half hour is .25 x 1,000 meters for 3 10-minute periods, or 750 meters. Climbing the dune face for the remaining half hour, he travels at the rate of .25 (for the sand) x .25 (for the moderate slope) x 1,000 meters for each of 3 10-minute periods. This works out to .25 x .25 x 3,000 = 187.5 meters . . . or a little less than one kilometer for the entire fourth hour's travel.

Using these tables together, the referee can simulate passage of a variety of terrain types and estimate a party's progress and course on a map.

LOSS OF ENDURANCE

Crossing desert terrain takes its toll on the human body, and a variety of factors work together to weaken the strongest character —

most especially if he ignores the time-tested body of Desert Survival wisdom which compels travellers to move by night, to rest in the shade, and to conserve their body energy and water.

The loss of a character's Endurance in desert travel is simulated by the use of **Endurance Loss Points** (or ELPs). The tables for desert movement gave the Endurance loss values for movement across several types of terrain. Additional causes of Endurance loss are given below.

ENDURANCE LOSS

Cause		Endurance Loss
TEMPERATURE:	For every 5°C above 30°C:	2 per hour*
	If character stays in shade:	1 per hour*
	For every 5°C below 10°C:	1 per hour*
* Endurance losses are applied only when the character is unprotected. The referee may make allowances for characters who find makeshift shelter (construct portable sunshades, or bury themselves in the sand to stay either warm or cool); protected characters (remaining inside air-conditioned structures or vehicles, etc.) suffer no ill effects from temperature.		
LACK OF FOOD:	For every day without food:	3 per day†
	Meager subsistence:	2 per day†
	On half rations:	1 per day†
† Character loses no Endurance points on his first day without food (including half rations). Half rations are considered to be one meal's worth of food, eaten at one time or spaced throughout the day. Meager subsistence is anything less than half rations.		
LACK OF WATER:	No water (character moving by day):	5 per hour¶
	No water (character in shade/day):	3 per hour¶
	No water (moving at night):	3 per hour¶
	No water (resting at night):	1 per hour¶
	Limited water (moving by day):	3 per hour¶
	Limited water (resting in shade):	2 per hour¶
	Limited water (moving by night):	1 per hour¶
¶ There is no Endurance loss for the first 2 hours after a character has had as much water as he wants (at least 1 liter).		
For moving at a slow run (which will cover twice the distance indicated for a specific terrain in the movement table):		3 x usual Endurance loss for terrain type EVERY 10 MINUTES
For moving at a full run (covering three times the distances given for specific terrain types in the movement table):		5 x usual Endurance loss for terrain type EVERY 10 MINUTES
For engaging in violent or heavy exercise — such as hand to hand combat:		5 EACH 10 MINUTES
For a character encumbered		1 per excess kg per hour

For example, a character walking in soft sand would accumulate 4 ELPs each hour, while covering half the distance normal for walking (about 3km/hr). If the character began running at a slow run or jog, he would loose 12 ELPs each 10 minutes he continued to run, and at the end of the hour, he would still pick up 4 ELPs for crossing that terrain. His jog would carry him across twice the distance he would normally cover walking, or about 1 kilometer per 10 minutes.

APPLYING ENDURANCE LOSS POINTS

An Endurance Loss Point is not the same as one of a character's Endurance levels in his UPP code. However, the accumulation of enough Endurance Loss Points will result in a drop in the character's overall Endurance stat. Any additional losses in character stats after Endurance reaches Ø are applied randomly against the character's Strength and Dexterity.

Either the referee or the player can keep track of a character's accumulated Endurance Loss Points. If at the end of any period of time, the character's total accumulation of ELPs equals that character's Endurance stat, that stat is reduced by 1. This loss is permanent until the character has a chance for complete rest and recuperation. If the character's Endurance level was reduced to 0, and if he suffered damage to other stats as well, he will require medical treatment and hospitalization for a complete recovery.

As an example, let's return to the lone character discussed earlier, who managed to cross 16 kilometers in four hours' travel. He has no water with him, but drank his fill before he set out. The temperature is 35°C; his UPP is 75946A (the Endurance of 9 is most important for the consideration of the desert crossing).

The character's first hour of travel is across flat ground, and he has an Endurance loss of 2 for the hour's walk, plus 2 for the 5° above 30°C, or 4.

After two hours, he has lost 4 more, for a total of 8.

During his third hour, he loses 4 points for his struggle through loose sand, plus 2 for the high temperature. It has also been three hours since he last had a drink, so he loses 5 more points to thirst. His total loss after 3 hours, then, is 19. The first of this hour's lost points brings him up to the level of his Endurance — 9 —, and at that point the character's Endurance level drops from 9 to 8. The remainder of the Endurance loss points (10) is greater than his new Endurance level, so the Endurance level drops by one more, from 8 to 7. He now has 2 Endurance Loss Points left over to add to his next hour's losses.

Things get rough during the fourth hour. In the first half hour, he loses 3 points walking in very soft sand (total: 5). In the second half hour, he loses 3 more points for soft sand, plus 2 points for each of the 10-minute periods spent climbing the sand dune, plus 2 points for temperature, plus 5 points for lack of water. During his fourth hour, he has accumulated 21 Endurance Loss Points. His present Endurance drops

to 6 with 14 points left over, then 5 with 8 points left over, then 4 with 3 points left over.

This character's next hour in the desert will render him unconcious (his Endurance level is reduced to 0) from thirst alone. Any additional losses in character stats after his Endurance reaches 0 are applied randomly against the character's Strength and Dexterity on a one-to-one basis. That is, for every Endurance point loss after the character's Endurance level is reduced to 0, he will lose one full level of either Strength or Dexterity.

ENDURANCE LOSS AND OTHER ENVIRONMENTAL SUPPLEMENTS

The **Desert Environment** goes into considerable detail with Endurance loss — with good reason, since thirst and heat are the two greatest dangers facing desert travellers. The system of Endurance Loss Points developed for this supplement differs in some details from that of other **Environments** rules supplements in this Gamelords series.

Referees who wish to apply the system presented in other supplements should not find conversion difficult. A character's Endurance is tracked by three separate values: permanent Endurance, basic Endurance, and temporary Endurance. Losses of Endurance caused by heat, thirst, and fatigue are subtracted from the character's temporary Endurance level, while the results of wounds are applied against his permanent Endurance. Basic Endurance reflects his need for periodic sleep.

The special Endurance Loss Point system developed for **The Desert Environment** allows the referee and players to quite clearly monitor the physical decline of characters suffering from the effects of heat and water loss. It need **only** be applied in such situations; outside of the desert, or within an air-conditioned base or vehicle, normal **Traveller** rules applying to Endurance are used.

CAUSES OF ENDURANCE LOSS

The **Endurance Loss Table** lists a number of ways by which characters can lose Endurance in the desert. These causes are more fully discussed below.

Temperature: Deserts are not all hot, nor are hot deserts always hot — even on earth. On a planet like Earth, the desert's lack of moisture and cloud cover allows far more sunlight to reach the desert floor than other environment types, and this usually means high daytime temperatures. At night, the same atmospheric conditions of low humidity and no clouds allow most of the desert's heat to escape, resulting in dramatic temperature drops of as much as 40°C. Travellers in the desert, then, must often contend with both extreme heat **and** extreme cold.

The section in this booklet entitled **Deserts and World-building** describes how the referee can determine the temperature of a desert he is creating. He should keep track of the temperature, which may change from hour to hour.

Characters can reduce the effects of temperature in several ways — primarily by staying out of the sun and by wearing clothing which minimizes the sun's effects (or by dressing warmly in the cold), and by taking shelter. These are discussed more thoroughly in the section entitled **Survival in the Desert.**

Lack of Food: Starvation is rarely a desert traveller's most serious concern; humans can survive for a month or more without food. However, lack of food can contribute to a character's over-all debilitation, weakening him when he needs every bit of strength to survive. Endurance Point Losses are not inflicted until the second day after the character's last full meal; in other words, he can go one full day without food without ill effects. Half rations consist of approximately as much food as would normally make up a single meal, though the referee may have to arbitrarily determine whether the characters are consuming more or less than that amount. Less than half rations is meager subsistance, and is included to represent occasional mouthfuls of food as they are found. Endurance point losses from lack of food are tallied at the end of each day; the referee may decide that a character found enough morsels throughout the day to add up to the equivalent of half rations.

Lack of Water: Water loss is the single most important danger in desert travel. There are seven separate conditions in which characters will lose Endurance points as they lose water; only while asleep at night with limited water available will they not loose enough body water to cause an Endurance Point Loss on this table.

Contrary to popular opinion, old Army survival manuals, and late-night Foreign Legion movies, rationing water does little to extend a character's survival time (desert travellers have been found dead of dehydration with rationed water still in their canteens). Even when water is in short supply, survival time can be lengthened by drinking what water is available, rather than trying to stretch it out. When characters have the opportunity — and **always** before setting out on a

desert journey — they should drink as much water as they can, stocking up, as it were, for the ordeal ahead. Characters who are able to drink their fill suffer no loss of Endurance points from lack of water for two hours after their drink, extending their survival time by that much. A man's stomach can hold up to about 1 liter of water; the referee can use this figure to determine what constitutes "drinking one's fill".

In temperatures much above 35°C, the average adult can lose as much as 1 to 2 liters of water per hour as sweat, water which must be replaced if the body's fluid balance is to be maintained. The chart below gives a rough idea of how water requirements increase with temperature. Game referees can use this to approximate the amount of water their players will need to survive.

WATER REQUIREMENTS
(per man per day in the desert)

Temperature	Limited Water	Ample Water
below 30°C	1 liter	2 liters
30°C to 35°C	2 liters	4 liters (1 gallon)
35°C to 40°C	4 liters	8 liters (2 gallons)
40°C to 45°C	8 liters	16 liters (4 gallons)
45°C to 50°C	10 liters	20 liters (5 gallons)

These figures are intended as approximations. Numerous factors can affect how much water a man requires. For example, men wearing no shirts are not cooled as efficiently by evaporation as men wearing light, loose clothing, and therefore have to sweat more (lose more body fluid) to keep their bodies cool. Men with sunburn lose a considerable amount of water through burned skin and into damaged tissue. Men eating foods high in protein (such as meat) or salt (such as salt-preserved foods) require more water than men on vegetarian diets (high protein diets require extra water to eliminate nitrogen from the body system, while diets high in salt require water to maintain a proper electrolyte balance in blood and tissue fluids.

Five gallons is too great a load for a man to carry on his back across the desert; obviously, only a vehicle of some kind would make this possible. Characters unable to carry such large quantities of water about with them must carefully plan their journeys around available water — both what they carry and what they expect to find — and they must plan to conserve their water through such tactics as travelling at night. Foresight, careful planning, and a generous portion of good luck are vital for safe crossings of particularly arid and inhospitable deserts.

The section entitled **Desert Survival** discusses several ways of finding, trapping, and conserving water, which characters with Desert Survival skill will know.

Other factors apply as well. Any type of violent activity — hand-to-hand combat, running, hard work — increases water loss and, worse, forces the individual to use up his reserves of energy in a remarkably

short time. The Endurance Loss Points given in these rules reflect the exhaustion brought on by vigorous activity in a matter of moments in desert heat.

PROTECTING AND RECOVERING ENDURANCE

Desert travellers can slow their loss of Endurance in a number of ways. In general, the referee should let the players think of these techniques themselves; however, any character with Desert Survival 0 or better will know them as part of his background and experience. When necessary, the referee should pass these techniques on to players with Desert Survival Skill, and let them pass them on to other characters who are newcomers to the desert.

Endurance can be protected (that is, the loss of Endurance points slowed) by the following:

Travel at night.
Stay out of direct sunlight.
Drink water whenever possible.
Avoid violent or vigorous activity (running, fighting, hard work).
Wear protective clothing.

Of these, the effects of the first four in surviving a desert **Traveller** adventure are taken into account by the tables showing Endurance loss under various conditions. The fifth — protective clothing — will vary in its effects, depending on the clothing and on the environment.

PROTECTIVE CLOTHING

Protective clothing can take one of several forms. A broad-brimmed hat will reduce the apparent temperature by 5°C if it is worn when the character is out in the sun. Thus, a character in full sunlight with a temperature of 40°C will earn 2 Endurance Loss Points an hour for the temperature if his head is bare, but only 1 point per hour if he wears a hat. There is no benefit for wearing a hat in the shade or at night.

People who live in or near the desert develop forms of dress over a period of years through a process akin to natural selection. Native dress will nearly always be designed to give the wearer an edge to survival in that particular area — by shielding the wearer from the sun, by promoting body cooling through evaporation, or by protecting him from the effects of sand, wind, or weather. Such clothing will reduce the apparant temperature by 10°C in direct sunlight, and by 5°C in the shade; at night, native clothing will increase or decrease the temperature by 5°C, whichever is necessary for comfort in that particular environment, providing warmth in cold desert nights, cooling the wearer in heat (since native wear will invariably include some type of head protection, characters cannot combine the effects of a broad-brimmed hat with native garb; they may choose one or the other, but not both.

Finally, special cases may be made for various types of survival gear. A vacc suit will protect the wearer against desert heat as long as

it remains sealed and operating. Special types of environmental suits exist which give the wearer varying degrees of protection against the desert. Some of these are listed, with their effects, in the rules section entitled **Equipment.**

The referee may make special judgment calls if the players come up with ingenious or clever ways of beating the heat, such as umbrellas or makeshift sunscreens made from pieces of wreckage. The guidelines given above for hats and native garb should enable the referee to come up with a reasonable reduction in Endurance Loss Points for such inventiveness.

RECOVERING ENDURANCE

Once a player's Endurance stat has been reduced, he cannot raise it again in the course of a single adventure. Long periods of rest (several weeks or more) are required to get the body back into shape after it suffers from heat, exposure, and dehydration. If a character has lost 1 or more Endurance levels, the referee should add the result of a 2D roll to twice the number of Endurance levels lost. This will give the number of days required for a character to build his Endurance level up to its former level (he cannot, of course, increase his Endurance level to more than it was previously). If his Endurance level was reduced to 0, he will require medical care and possibly hospitalization to recover.

In the course of a single adventure, a character's accumulated ELPs can be reduced, slowing the character's loss of Endurance. The following table shows the ways this may be accomplished.

RECOVERING ENDURANCE

Activity	ELPs Reversed
Resting 10 minutes per hour of travel (in shade or at night only)	1
Drinking as much water as desired (minimum 1 liter)	5
Drinking some water (up to about 1/2 liter)	3
Drinking 1 mouthful of water (120cc or 2 fl.oz.)	1
Resting for 1 full hour	4
Resting for at least 6 full hours	10

Note that the total accumulation of Endurance Loss Points is tallied first at any given time, and reductions in the character's Endurance levels are immediately determined. Any reduction of Endurance Loss Points is applied against left-over ELPs, after all other calculations have been made.

Desert Terrain

There are different types of deserts, and how and where a desert was formed determines the kinds of terrain features found within it. The following list gives some of the factors which cause deserts in the first place, and how this is likely to affect the desert's topography.

Continental Desert: Deserts form in the interiors of very large continental land masses, where the prevailing winds are such that they bring little or no moisture from surrounding seas. Fertile areas occur along rivers, but in a large landmass, rivers will be relatively few and far apart, leaving very large stretches of arid land between them. The primary cause of erosion is wind; hence these deserts may tend to be sandy, with vast 'ergs' or dune seas.

Windshadow Desert: Deserts form when a range of mountains blocks moisture-laden clouds billowing in from the sea, causing the clouds to drop rain on the windward sides of the mountains only. Seasonal melting of mountain ice will cause numerous rivers and drainage gullies on the leeward slopes, however, resulting in heavy water erosion. These deserts may tend to be badlands types, with water-carved mesas, buttes, river canyons, and harsh and rugged terrain.

Coastal Desert: Deserts may begin where the beach dunes leave off on the coast of an ocean or large sea. This effect is caused by the effects of cold ocean currents and offshore winds which prevent rain from ever falling on the shore. Coastal deserts are extremely dry, often completely rainless, though they may frequently be drenched by periodic dew or fog when cold, moist air moves inland.

Land Erosion Desert: All deserts suffer from erosion to varying degrees, but man-made deserts are created when indiscriminate tree clearing, poor farming techniques and overgrazing by domestic animals results in the loss of vegetation which holds down topsoil and protects the land from the effects of wind and water. These deserts are often windblown and dusty, and found bordering agricultural or grazing lands, upon which they are encroaching at the rate of many square miles each year.

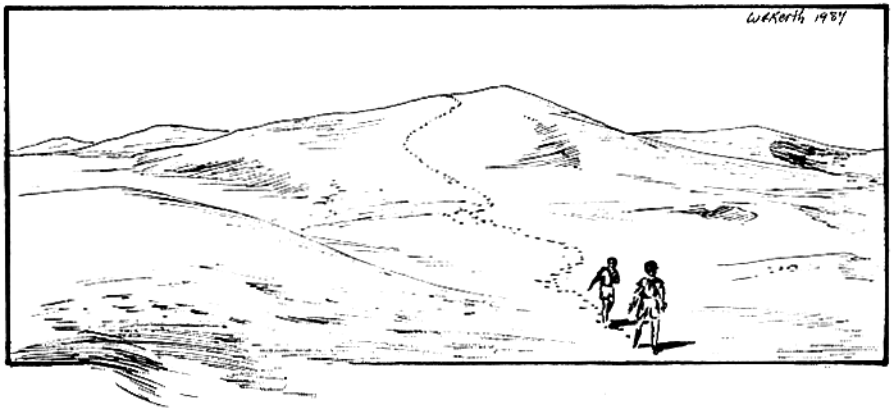
Artificial Deserts: On some worlds, deserts will have been quite dramatically created by the hand of intelligence, as the result of weapons or ecological disasters which leave the land incapable of supporting life. These deserts will display a variety of terrain features, will usually have more moderate (and moist) climates than natural deserts, and may include both widespread ruins of former inhabitants, and, possibly, remnants of whatever caused the desert in the first place, such as areas of radioactivity or lethal microorganisms.

High-Altitude Deserts: High mountain plateaus, or the surfaces of worlds with thin or very thin atmospheres may be deserts because of the thinness of the atmosphere. Thin atmospheres cannot carry moisture efficiently, but do promote the rapid evaporation of bodies of water. Ultra-violet radiation from the sun is not screened by atmospheric ozone layers, presenting a serious problem for any native life forms, and heat trapped in the rocks during the day is very quickly lost to space at night. These deserts tend to be utterly barren, and no matter what the daytime temperature, the temperature at night will be bitterly cold. Erosion is caused by wind-blown sand (which can be moved about even within extremely thin atmospheres), and by continual freezing and thawing, which tends to split rocks over thousands of years into a uniform rubble which covers the ground.

Technically, the surfaces of airless worlds or moons could be called deserts by this definition. Since lack of water is not the biggest problem travellers on such worlds have, however, vacuum environments are not covered in this book.

Extreme Climactic Deserts: On worlds where the temperatures are simply too high to support life, the result is a world-wide, lifeless desert. If the world is far enough from its sun that only the equatorial regions are subjected to killing heat, tropical and even sub-tropical zones might be found at high latitudes, with a world-girdling belt of desert at the equator. These deserts will be lifeless, and the worlds on which they exist might exhibit two radically different families of native life isolated from one another by the dividing band of impassable temperatures. The main erosion forces in such deserts will be wind and sand, resulting in dune seas. Water run-off at the edges of the deserts wil create water erosion features, such as badlands and canyons.

Arctic Deserts: Technically, polar, mountain, or glacial ice caps are deserts, since water, while present, is not readily available. The air is extremely dry, and over-all climactic conditions can realistically be described as arid. The problems of survival in polar desert conditions are different in several particulars from other deserts, however, and are not dealt with in this booklet.



CREATING DESERT TERRAIN

How much desert a given world has depends largely on how much water is available. A world with a small hydrosphere (less than 10%) will most assuredly be desert over nearly all or most of its land area. However, even planets like Earth (hydrosphere 70%) can have large desert areas, particularly in the centers of very large continents, or in the lee of high mountains. Temperature extremes are nearly always a minor factor in the creation of deserts — usually a result of deserts rather than a cause — and deserts are as likely some distance from the world's equator as they are in the tropics.

DESERT PERCENTAGES

Planetary Hydrographic Percentage	Desert as a Percentage of Land Area
>80	<10%
70-80	20%-30%
60-70	30%-40%
50-60	40%-50%
40-50	50%-70%
30-40	60%-80%
20-30	70%-90%
<20	90%-100%

The table on the left gives a rough means of estimating how much of a world's land mass will be desert, depending on the hydrographic percentage. This should be taken as a very rough approximation only; large continents will tend to have large deserts in their interiors no matter how large the over-all percentage of land to water.

The referee should remember that there will always be exceptions that change the table's results. For example, a planet with a relatively low hydrographic percentage may be envisioned with a surface covered by extensive swamps, marshes, and small, shallow seas, with very little (if any) desert. Another world with large oceans could be in the grip of a glacial period which has locked up so much of the planet's fresh water that most of the non-glaciated land is arid. These will be special cases, however, created for specific purposes by the referee. Nearly all other planets can be assumed to have the typical patterns of winds, currents, land masses, and mountains which will contribute to the formation of at least some desert land.

Small worlds tend to lose their store of water faster than planets with higher surface gravities. Worlds with thin atmospheres tend to lose their water stores faster through evaporation, and because their atmospheres admit more heat and light to the surface by day, and allow more heat to escape at night. The percentage of desert land area on any planet is increased as shown in the table at right.

DESERT AREA INCREASES

Planet has	Desert Area Increased by
Size 6	+10%
Size 5	+20%
Size 4	+40%
Size 3 or less	+60%
Atmosphere 4, 5	+20%
Atmosphere 2, 3	+40%

For example, a particular planet has a UPP code of 456775 (size 4, atmosphere 5, hydrographic percentage 60%). The first table, **Desert Percentages**, tells us that some 30-40% of the planet's land surface will be arid. The second table, **Desert Area Increases**, adds 40% for the size

and 20% for the thin atmosphere. The land area of this world will be 90-100% desert.

Totals of more than 100% are considered to be 100%, though the referee can, if he wishes, interpret values of more than 100% to indicate extremely arid and inhospitable conditions.

It is important to remember that even worlds largely covered by deserts are likely to have some regions which have enough moisture to alleviate the harsh environment, so long as they have hydrospheres of at least 10% and their atmospheres are thick enough to permit liquid water. Water will evaporate from even small seas, and fall elsewhere as rain or snow. In the example given above, it is likely that most of the coastal areas of this small planet will support life easily, as will river valleys, and the regions surrounding lakes and oasis.

TEMPERATURE

When trying to survive in a desert, it is important to have some idea how hot or cold it is going to get. Besides this, the referee of the adventure will need to know how hot it is for determining Endurance Loss Points from hour to hour.

The referee must first create a mean temperature for the particular area of the world he is interested at the particular time of the adventure. Temperature can vary widely and wildly on different worlds, depending on such factors as how hot the local sun is, how far the world is from its sun, whether or not the planet has an eccentric orbit, and even the density of the atmosphere.

When dealing with a planet like Earth in most of these respects, it is convenient to use the following temperatures as averages:

Tropics (0° to 20° north and south latitude):	30°C
Subtropics (20° to 40° north and south latitude):	20°C
Middle latitudes (40° to 20° north and south latitude):	10°C
Polar latitudes (beyond 60° north and south latitude):	0°C

On Earth, these temperatures rise and fall as the seasons (brought about by Earth's axial tilt) change; mid-latitude temperatures can range from -20°C or less in the winter to +40°C or more in summer.

On worlds different from Earth, the referee must use his own judgment, based on the kind of planet he is trying to create and the needs of the adventure he has in mind. Almost anything is possible on a planet with large seasonal or orbital variations.

The following chart gives positive and negative values for temperature, with different causes for temperature change. The referee can pick those causes which seem to apply and total the temperature modifiers, adding this figure to the basic temperature he has chosen for the planet. Temperature means are based on conditions at dawn or dusk, in spring or fall, in calm, clear air. The result will be a general range of temperatures (such as 30-40°); if the referee needs to determine an exact temperature (as when he must calculate Endurance Loss Points) he can use any randomizing method he desires to get a precise value from

this range, or deliberately choose the value which best suits the situation he is creating.

TEMPERATURE CHANGES

Cause	Change by
Summer season§	+10°C-20°C
Winter season§	-10°C-20°C
Day, atmosphere type 6 or 7	+5°C-10°C
Night, atmosphere type 6 or 7	-5°C-10°C
Day, atmosphere type 4 or 5	+10°C-20°C
Night, atmosphere type 4 or 5	-20°C-30°C
Day, atmosphere type 2 or 3	+15°C-40°C
Night, atmosphere type 2 or 3	-20°C-50°C

§ Seasonal variations do not affect a planet's equatorial regions unless they are brought on by a highly eccentric orbit. Summers will be hotter and winters cooler at a world's equator only if the entire planet is nearer to or farther from its sun, not because of the world's axial tilt.

To illustrate the preceeding, in the world used as an example above, with a UPP of 456775, the referee is determining the range of temperatures for a desert near the equator. For various reasons, he has decided that this world is colder, on the average, than Earth (perhaps it is more distant from its sun, or circles a cooler star), and has assigned a mean temperature of 10°C to the equatorial regions. He decides that the planet does have seasons to about the same degree as Earth, and that the adventure he is creating will take place during the local winter (all of this information is determined arbitrarily by the referee).

Since the seasons are caused by axial tilt rather than an eccentric orbit, seasonal variations do not affect equatorial temperatures. The major cause of temperature extremes will be the world's thin atmosphere.

By adding up the appropriate figures from the third table, Temperature Changes, the referee arrives at a daytime mean temperature of (+10 plus +10-20° =) 20-30°C. At night, the temperature plunges to (+10 plus -20--30° =) 10-20 below 0°C.

The referee should remember that these figures are to be used as approximations only. So many factors can effect the actual local temperatures — including such variables as altitude, local vulcanism, storms, the length of the planet's day, and even cloud cover — that the referee should treat this information as vague guidelines only, rather than strict rules for determining temperature.

This information can also be used by the referee to simulate the increase in temperature as the day wears on. Temperatures will near the local mean (modified for season, of course) at about 3 hours after dawn. They will be at their highest at around 3 hours after noon, and they will decline until they are back at the local mean at around 3 hours past sunset. The rise in temperature during the day should be spread out evenly from 9am (or its local equivalent) to 3pm, and the hourly increase

taken into account when determining a character's Endurance Loss Points. Obviously, travel in the desert is easiest in late afternoon and early morning.

This cycle is repeated for the drop in temperature at night (though in fact, the temperatures remain at their lowest point from 3 hours past midnight until almost dawn).

Other planets will be unlikely to have 24-hour days, of course, though for various reasons, worlds like earth will tend to have days of between 18 and 29 hours. Referees needing a precise (random) figure can roll 2D-1 and add this figure to 17 to get an hourly value to work with. Dividing this figure by 4 will break the day into quarters — 'forenoon' (the temperature rises from mean to maximum); 'afternoon' (temperature falls from maximum to mean); 'foremid' (temperature falls from mean to minimum); and 'aftermid' (temperature remains around minimum, then rapidly climbs to mean at dawn).

Referees interested in an extra degree of realism can calculate the hourly increase or fall in temperature based on a 24-hour day, then change the temperature each hour by the indicated amount regardless of the actual length of the local day. This means that on worlds with shorter days than earth, the temperature will start out at the mean and rise, hour by hour, but by the beginning of afternoon, when the temperature starts falling again, it will not have reached the high indicated by the temperature tables. On planets with longer days — hence more hours — the temperature will climb past the indicated high until afternoon, and fall past the indicated low during the night. This method is optional, of course, and can be modified in any way the referee sees fit in order to increase the realism of the situation he is creating.

PLACING DESERTS

There are no hard and fast rules for placing deserts on a world the referee is creating. Instead, the referee should use the list of types of deserts listed in the section below entitled **Desert Terrain** to place deserts where they might logically be formed on the planet. The largest will be planet-wide deserts, of course, created by a planetary hydrographic percentage of Ø, by low atmospheric pressure (high-altitude deserts), or by extreme climatic conditions.

On worlds like Earth in most respects, the largest arid regions will be continental deserts, which may in fact occupy belts from one continent to another, but which generally are restricted to the interior of large land masses.

Windshadow deserts are smaller and are found lying next to mountain ranges which block the prevailing wind; usually, but not always, there will be a narrow strip of very fertile coastland next to a large body of water on the opposite, windward side of the range.

Coastal deserts lie next to the sea. Since they are partially caused by cold, deep-water currents, the body of water adjacent to a coastal desert is usually large, quite deep, and is open all the way to the cold polar waters.

It is possible for various types of deserts to blend imperceptibly into one another.

The land bordering a desert will share some of the desert's characteristics, of course. Except for special cases, such as river valleys and desert oases, the transition from desert to another environmental type will be quite gradual. Usually, the land next to a desert will be semi-arid, receiving more water than the desert, but still dry by most standards. Such environment types include steppes or prairie (semi-arid, flat or rolling grasslands), tundra (land with permanently frozen subsoil and sparse, simple vegetation), ice caps (in environments where the ice is not melting and watering surrounding lands), and any dry, barren, open territory better for grazing than for growing.

DESERT TERRAIN

There is more to most deserts than endless sand, and desert travellers are likely to encounter a variety of desert features in the course of their wanderings. The following section lists some of the more common terrain features, and notes special problems, dangers, and opportunities for each.

There are three basic types of desert surface, each distinguished by the size of the particles that make them up.

Hammada: Rocky desert, generally a weathered, wind-polished plateau. Hammada generally exhibits unusual rock formations shaped by wind erosion.

Reg or Serir: Desert surface composeed of gravel (reg) or pebbles (serir), often laid down in a mosaic pattern. These surfaces are usually formed by water action, and may be found as alluvial plains at the end of wadis or arroyos (see below).

Erg: Vast, sandy wastes formed as accumulations of medium to very fine sand, and occupied by dunes. The sand may be hard-packed and firm, or quite loose and soft.

Less arid regions may have surfaces composed of what are known as 'semi-desert soils', which will support grasses, scrub brush, and other hardy vegetation. True desert soils contain no humus and will support only plant life radically adapted to desert conditions.

Within various types of deserts, a variety of terrain features will be encountered. The most common are listed below.

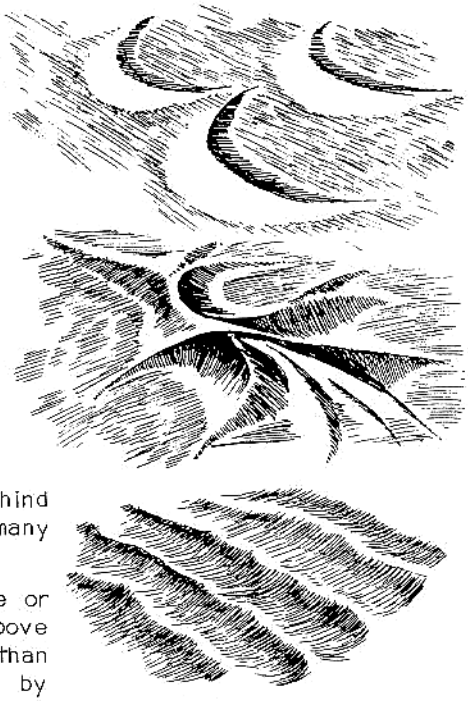
Dunes: On Earth, the Sahara Desert of Africa and the Empty Quarter of Arabia best typify the popular concept of deserts— endless stretches of burning sand sculpted by the wind into the successive crests and valleys of a dune sea. There are four types of dunes.

Longitudinal or Seif dunes: Strong, single direction winds create these sword-shaped dunes, divided by deep troughs or valleys parallel to the wind direction.

Barchan dunes: Cresent-shaped dunes formed in areas where sand is relatively scarce. They move slowly with the wind which shapes them, in the direction the low ends of the dunes are pointing.

Stellar dunes: Stellar (or star) dunes are created in areas where the wind blows from different directions. Unlike other dune types, they are stationary.

Transverse dunes: These are produced by moderate winds blowing steadily from one direction which shape the sand by removing fine particles and piling coarser grains into a series of ridges at right angles to the wind, one behind the next. Each dune may be many kilometers long.



In any given erg, one type or another of the dune types listed above will predominate. Rarely will more than half of any desert be covered by dune topography; dunes are made of sand, particles of eroded rock carried by the wind from some other part of the desert.

Dunes vary in size, and can be enormous. Some have been measured at over 200 meters tall. The slope facing the wind (the 'windward' slope) is usually flatter than its opposite side (the 'leeward' slope) which may be preciptious, though it can still be quite steep. Active dunes (that is, dunes which are still growing and moving with the wind, rather than overgrown and anchored by vegetation) are considered to be composed of very soft sand for movement purposes, and can be quite difficult to climb.

Hammada: Hammada is the name given to desert or near-desert terrain, mostly bare rock scoured and carved by wind-blown sand and water — a more familiar term is 'badlands'. The fact that some kind of rock (sandstone, limestone) weathers faster than other kinds of rock (basalt, granite) results in a bewildering variety of strange, fantastic, and beautiful rock formations in badlands country. A few of thse formations are described below.

Canyons: Canyons may be created by seismic activity — along a fault in the planet's crust, for example — but are usually the result of water erosion, caused by swift-flowing rivers literally eating their ways down through layers of sandstone or other soft rock. For this reason, they are excellent windows into a world's geological past, since they allow scientists to examine successive layers of rock, one atop another, as they were laid down during the planet's history. Rivers or streams will

nearly always be found in young canyons, but may have vanished from old and weathered ones.

Canyons may present **Traveller** adventurers with serious obstacles; young canyons have sharp, near-vertical sides, while older canyon walls may be eroded and precariously placed. The adventurers will usually be unable to scale these slopes without special climbing gear and experience (referees are referred to another volume in the **Environments** series from Gamelords, Ltd., **The Mountain Environment**, for rules and equipment descriptions for simulating attempts to scale cliff faces).

Canyons may be small or vast. The Grand Canyon on Earth, carved by the Colorado River, is 349km long and 1.6km deep, and ranges between 6 to 29km across. On Mars, the Vallis Marineris (a rift valley) is 40,000km long and 6km deep. For the purposes of these **Traveller** rules, the difference between a small canyon and a gulch (see below) is whether or not the sides can be climbed with relative ease in an hour's time.

A particular danger presented by canyons is the possibility of wandering into a dead-end. A party trying to move through a canyon along its floor can be delayed for days by entering the wrong branch of a many-branched canyon chain, and being forced to retrace its steps. Travelling downstream (assuming there is still a stream to follow, and assuming the stream is known not to disappear under a cliff at the end of a cul-de-sac), or receiving navigational aid from a satellite or orbiting space craft eliminates this problem.

Other dangers in canyons are presented by rockfalls, by animals which take advantage of concealment offered by the jumbled rocks and cliffsides, and by the possibilities of ambush by enemies or hostile natives, if any.

The advantages of travelling along the floor of a canyon include the presence of water (assuming a river or stream is still present), game (which will live close to water), and shade from the sun (a real bonus, especially in deep, steep-sided canyons where the sun may penetrate to the floor for only a few hours around midday).

Gulch: A gulch is a river bed working its way down to canyon status. It is cut into the desert floor by moving water, and, like canyons, often (but not always) has a river or stream at the bottom. Unlike canyons, the sides of a gulch can be climbed without special equipment or climbing experience, though they may still be rather steep, especially near the top.

The effort required to climb the sides of a gulch may be simulated by rolling against the characters' Endurance levels every 10 minutes they work their way down or up the side of a gulch; failing an Endurance roll forces the character to rest for ten minutes or results in the loss of one Endurance level (in addition to any other losses due to the accumulation of Endurance Loss Points). It will take 1D ten-minute periods to go up or down the slopes of a gulch.

Characters navigating the sides of a gulch risk injury from falls or sliding rocks. Each character should roll 2D once during both ascents

and descents. An accident of this nature will occur on a roll of 10+, but the character will have one chance to make a saving roll against Dexterity; if the 2D roll is less than or equal to his Dexterity, he will be able to leap aside from the falling rocks, grab something solid as the ground goes out from under him, stop his fall, or whatever is appropriate in the situation. Event tables created by the referee may create periods of danger for everyone in the party in addition to this roll.

Arroyo: Arroyos, also called wadis, are (usually) dry streambeds worn into the desert floor by runoff from periodic rainstorms. Frequently, they open out into broad alluvial plains called playas, made of sediments or mineral encrustations deposited by evaporating water.

Arroyos offer no particular hindrance to desert travel, but do present one particular danger. Flash floods can race down through dry gulleys many miles from where it is actually raining, and travellers who happen to be walking or encamped in them are in serious trouble. The problems they cause are discussed in greater detail in the section on **Dangers of the Desert.**

There is also a particular opportunity presented by arroyos — water, always a concern in the desert. Even the driest dry streambed often has water under the sand, perhaps a meter or two beneath the surface. It can be reached by digging, or, in some places, by using a long tube as a straw. Obtaining water in this fashion is described in more detail in the section on **Finding Water.**

Mesas, Buttes, and Columns: As a river erodes its way down through layers of desert rock, it may isolate an island of rock left standing to mark where once lay the surface of the desert. Mesas are flat-topped, vertical-sided plateaus which may cover may square kilometers. Buttes are mesas that have been worn down till they have little or no flat top at all. A column is a verticle spire of rock, possibly hundreds of meters high, but only a few meters or tens of meters thick.

The main usefulness in these terrain features lies in the fact that their odd shapes provide the desert with easily recognizable navigational markings. While one sand dune will look very much like another, rock formations in inhabited areas are often distinguishable enough to have names, and bearings can be taken on them using compass, sun or stars, or guesswork.

Other peculiar erosion features which can be used in this way are natural bridges or arches (where water or sand has worn a hole through a rock wall), pedestal rocks (columns made into hour-glass shapes by sand which is not lifted more than a few meters above the desert floor), volcanic dikes (wall-like intrusions of very hard, basaltic rock into sandstone which are exposed when the surrounding soft rock is worn away), and capped pillars (columns balancing large boulders, an effect caused by the fact that the boulders themselves have protected the rock directly below them from erosion).

Climbing any of these geological oddities, for whatever reason, is usually difficult and dangerous, requiring climbing gear and experience.

Flats: Large bodies of water may steadily dwindle as desert encroaches on the region, leaving behind a layer of mineral deposits collected by the water and concentrated by evaporation. Inland seas turn into salt lakes which may be surrounded by hundreds of square miles of encrusted salt. Eventually, the water is completely gone, and only the salt flat is left. Other minerals deposited in this way include borax, gypsum, and a variety of minerals which form what are categorized as alkalai flats.

Salt and mineral flats are dangerous to cross. Water is particularly scarce, and what can be found is usually contaminated. The minerals themselves can cause blindness when windblown, and the effects of the sun can be worsened by light and heat reflected from the bright white desert floor. Since flats represent the bottom of an extinct seabed, they are usually lowland formations — valleys or depressions — which help trap and increase daytime heat. These dangers are discussed in detail in the section on **Dangers in the Desert.**

Oases: Wherever ground water seeps to the surface of the desert, a fertile zone with growing plants called an oasis is created. Oases often — but not always — are created around standing, open water — a pool or small pond. Sometimes, the available water is trapped underground, but in such amounts that vegetation can take advantage of it.

Some desert pools (even bodies such as large lakes or inland seas) are salty. Remnants of a sea which once covered that area of desert, evaporation has resulted in the volume of the water becoming less, while the concentration of salts and other minerals in the water grew. Salt lakes of this type are usually marked by extensive salt or mineral flats surrounding them. Vegetation may surround such pools, but usually the area will be quite desolate and inhospitable, since the salt tends to poison the ground.

Pools which are not salty may be contaminated by other agents — notably alkalai chemicals or disease micro-organisms — and be unfit (even deadly) to drink. Poison water holes often give grim warning — the carcasses or skeletons of animals suggest deadly water. Unfortunately, water holes so instantly fatal (or fatal to both native animals and off-worlders) are not nearly so common as those which produce symptoms hours — or even days — later. More information is given on the dangers of impure water in the section on **Danger in the Desert.**

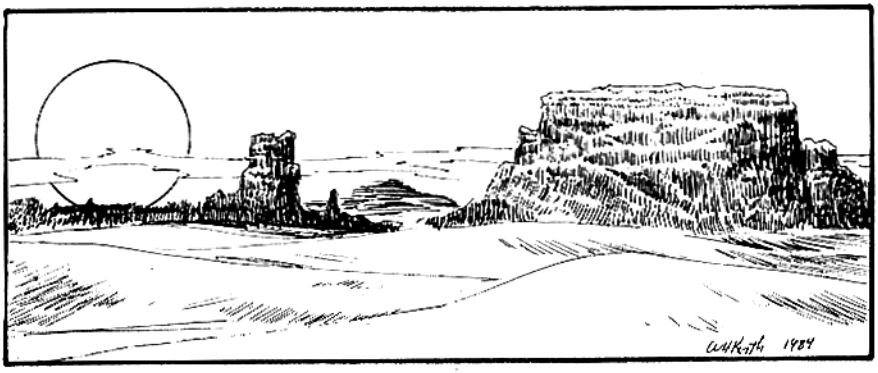
Oases with pure water are often the basis for travel in the desert, for most desert crossings are planned reaching from oasis to oasis. Since few expeditions can manage to transport the recommended 5 gallons (20 liters) of water per man per day for desert travel, frequent stops at water holes become the only feasible alternative.

Another bonus at an oasis is shade; the local equivalent to palms and other tropical trees and plants will grow in great profusion around a waterhole. Large bodies of water may support many square kilometers of greenery in the midst of the most inhospitable environment, and even small oases will have enough vegetation to provide shade for relief from the desert sun.

Still another advantage at any water hole is the availability of food. Desert animals congregate at desert watering spots — especially around dawn and dusk. In fact, one way to locate a nearby oasis is to follow animal trails encountered in the sand, which in the morning lead away from the hole and in the evening lead towards it. Animals which are suitable as food may be taken at a water hole, while larger oases may provide a wide variety of fruits from the trees and even fish from the water. On inhabited worlds, there is a good chance that a permanent settlement has grown up within a large and well-placed oasis — especially in deserts criss-crossed by trade routes which depend on certain oases as rest and water stops. Water and supplies, equipment, directions, native guides and other necessities will nearly always be available at inhabited oases — as well as opportunities for **Traveller** adventures.

DESERT MAPPING

With the general information presented above, the referee can create detailed maps of the desert where he is planning a **Traveller** adventure. Any reasonable scale can be used, so long as typical travel distances can be calculated on it. For example, a map on hex-grid paper with a scale of 1hex:1km would be useful for plotting hour-by-hour travel; at this scale, most of the terrain features listed above would fit into a single hex, and would be encountered by an adventuring party after they entered that hex, at a time determined by the referee. Daily travel can be recorded on a map with a scale of 1hex:10km, though the referee will need greater detail for events within individual hexes for encounters and terrain features.



Conspicuous landmarks such as buttes or rock columns can serve as directional or navigational markers across distances of as much as 30 kilometers during the day. These should be marked on the referee's map, and a notation made so that the feature can be described to players who state during the course of the game that they are looking for such.

The referee can use any map symbols he desires, so long as they are consistant. When mapping a desert area for a **Traveller** adventure, he should take note of the following recommendations:

* The general desert type (erg, hammada, or reg/serir) should be noted.

* Sand areas will be found in any of the three desert types, but ergs are entirely sand; areas within an erg of particular soft sand can be noted on the referee's map but should not be revealed to players unless a land survey of some kind is assumed to have mapped and marked it.

* Barchan dunes may be found in hammada or reg desert types, but rarely, and usually toward the edge adjacent to an erg. Longitudinal, transverse, and star dunes are found only in ergs. Because the shape of dunes is determined by prevailing wind conditions, various types of dunes are seldom found intermingled. When mapping a dune region, the referee should determine from which direction the wind is blowing, how strong it is, and how variable. This information can be used to pick one of the four dune types.

* Arroyos and gulches may be found anywhere, but are associated with periodic (if infrequent) rainfall, and will not be found in deserts where it never rains. They may end in extensive mineral flats or in reg or serir type terrain.

* Salt or mineral flats will be found in lowland areas such as desert valleys, and may possibly be associated with a salt lake.

* Rivers can exist within deserts, though they will be isolated and rare. They nearly always will have cut a canyon for themselves into the rock in reg or hammada-type terrain. In ergs, the presence of water and accumulated silt will create a fertile strip on either side of the river which will serve to hold the sands of the desert at bay. The width of this green zone will depend on the size of the river, and it may be thought of as a very long, narrow, meandering oasis which can cross thousands of kilometers of desert territory. The classic example of this type is the Nile River Valley on earth, which is maintained and extended by flooding and irrigation.

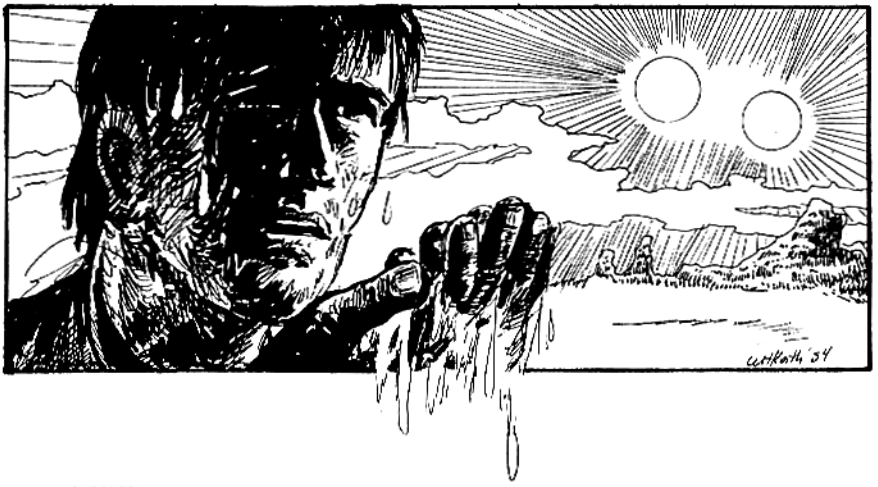
* Oases are not necessarily permanent desert features. Those marked on old maps which the travellers may have in their possession could be dry or, if positioned in or near an erg, overwhelmed by the encroaching sand dunes. The referee should use his discretion in frustrating his players in this way; a dry waterhole can easily mean the difference between life and death for an entire party.

* The desert itself will be surrounded by semi-arid land such as grassland or prairie. The chief differences are found in slightly more rainfall, and in soil capable of supporting a variety of plants. Mountains are also a possibility, particularly when the desert itself is a rainshadow desert created by drought-producing blockage of rain bearing winds.

Traveller referees creating maps for an adventure in the desert should especially remember that deserts are **empty.** The most immediate obvious fact about desert terrain is that it contains miles and miles of nothing in particular except sand and rocks. While dune regions will have many dunes of a particular type, the entire desert will be given over to less than half dune terrain, and the dunes themselves tend to be repetitious and uninteresting. Interesting terrain features — rivers, canyons, arroyos, odd-shaped rocks, and especially oases will be relatively few and far between, and should be introduced sparingly.

Survival in the Desert

Characters with Desert Survival skill will have a number of tricks for surviving in arid country. It is up to the referee — based on a character's skill level and likely past experience — to decide how many and which of the techniques listed in this section that character is likely to know.



FINDING WATER

Without doubt, the most serious problem facing desert travellers is shortage of water. There are a number of tricks known to desert dwellers and others with first-hand experience of desert conditions for finding and obtaining this priceless commodity.

Animal tracks: Desert animals seek waterholes at dusk and dawn. In sandy country, their tracks may be encountered and used to guide a party to nearby water. In the morning, these tracks will lead **away** from the waterhole, since the animals will have finished drinking and be seeking shelter from the sun. In the early evening, they will lead towards water. Confusing tracks made earlier may still exist, but are usually erased during the course of the day by desert winds. The referee should roll 10+ on 2D for characters to encounter animal tracks (assuming the planet they are on has animal life, of course). Interpretation of the tracks should be left to the players, but the referee may guide characters with Desert Survival-1 or better since they would be expected to know the significance of the tracks. Unless the referee has deliberately planted the tracks to hint at the existance of a waterhole known to the referee, the distance to the water will be 1D/2 km (i.e., 3 = 1.5km).

Waterholes: Waterholes may be anything from a muddy puddle among the rocks to a desert oasis surrounded by many hectares of lush vegetation. They provide unlimited amounts of water. The referee should roll 2D to determine ahead of time whether or not a waterhole is safe to drink from. The water will be safe on a roll of 9 or less. If the result is 10 or more, roll 2D again on the table below.

WATERHOLE CONDITIONS

Roll	Result
2-7	Water brackish or salty. Characters who drink it anyway will become sick within 10 minutes, and suffer 1D damage points. Characters with Desert Survival skill 0+ will know better than to drink it. Such pools may be surrounded by salt or mineral encrustations; a small sip (not enough to cause damage) will give warning also.
8-9	Water seems okay (possibly it has an unpleasant smell and/or a scum around the edge of the pool). In fact, it contains micro-organisms which make any who drink it sick. Effects of drinking the water may show up anywhere from 4 hours to several weeks afterwards; the exact effects, the severity, and the course of the disease are up to the referee, though it will cause at least 1D damage points when it first appears (due to vomiting, diarrhea, excess perspiration, general debility, and/or other symptoms).
10+	The waterhole is poisonous. It causes an immediate 2D+3 damage points to any who drink from it. Warning may (though not always) be given by bones or bodies of poisoned animals nearby, or by warnings posted by local natives, if any.

Water with microbial contamination can be purified by boiling it for 10 minutes, after which it will be safe to drink. Salty or poisonous water can be made fit to drink with chemical or mechanical purification methods (see **Equipment**) or by using it to charge a solar still (see below).

One serious danger is encountered on worlds made desert by nuclear warfare. Depending on how recently the war ended, it is possible that all water supplies, both ground water and rainfall, are radioactive. Obviously, any **Traveller** party venturing onto a planet with residual high radiation should take its own water supplies, and carefully avoid local contaminated sources.

Dry Streambeds: Arroyos, dry gulches and streambeds, and wadis may appear bone dry, but often water can be found within a meter or two of the surface. Runoff water from a recent rain will have flowed through the gully, seeped down into the sand, and becomes trapped in a clay or rock layer where it may remain accessible for months. Characters can dig for water with their hands if it is within .5 meter of the surface. Shovels (including madeshift implements) can be used to reach water up to 2 meters down with 1D x 30 minutes work. Digging with bare hands is harder,

and will require 1D hours to dig no deeper than 1 meter. The water recovered will usually be muddy and may taste bad, but will usually be drinkable. If it is undrinkable (11+ on 2D), it can be used to "charge" a solar still (see below), or filtered to remove impurities.

To find water in a dry streambed, the referee rolls 2D. The roll is modified by -2 in sandy areas and ergs, or by +1 in reg or serir deserts.

Roll	Result
0-5	No water
6-7	Water at depth of 1.5m-2.0m
8-9	Water at depth of 0.5m-1.5m
10+	Water at less than 0.5m depth

On results of 10+, the referee may roll 2D a second time. On a roll of 9+, the water will be so near the surface that it will create a 'damp spot', apparent to local natives and to characters with Desert Survival-2+. In these areas, water can be obtained by slipping a straw (preferably with a cloth filter) into the sand and sucking water directly from the ground.

The amount of water obtained will vary. The referee rolls 2D to determine the amount available to each character.

Roll	Result
2-6	<0.1 liter
7-8	0.1 to 0.5 liter
9-10	0.5 to 1.0 liter
11	1.0 to 2.0 liters
12	Unlimited water

More water can be obtained by using damp soil to charge a solar still (see below).

Smelling water: Desert natives may have the ability to 'smell' or otherwise guess the existance of water where it would not otherwise be expected. Characters with Desert Survival-3+ may, at the referee's discretion, also enjoy this talent. Characters who attempt to 'smell out' water will find it on a roll of 13 on 2D, using their Desert Survival skill level as a positive DM. It can be recovered in precisely the same way as water in dry streambeds, save that it is not restricted to streambeds, but can be found anywhere. This talent should be given and used with caution, to avoid eliminating entirely the problems caused by lack of water in the desert. The referee may wish to allow characters with psionic skill (either clairvoyance or special) to attempt to locate water in this way, using their skill level as an additional modifier.

Water-bearing vegetation: Some desert plants have adapted to survive in arid climates by storing water. The referee may wish to invent such plants when he creates the desert; their description and potential will be known to natives who live in that region, but not to off-worlders (even those with Desert Survival skill, since plant species vary from desert to desert and world to world) unless they have specifically researched the flora of that planet.

The referee should remember that a certain species of plant will not necessarily be found in more than one desert region of a particular planet, nor will it grow everywhere throughout a single desert.

Contrary to popular myth, water-storing desert plants do not contain pure water (there would be no survival advantage in their doing so, since

it would be too easy for the store to be lost). Instead, certain parts of the plant's interior — within the pulp of stems or the body, or inside subsurface tubers and roots — will be extremely moist. It may be possible to squeeze or suck moisture from slices of the plant. It is likely that water obtained in this way will be cloudy and have an unusual — possibly a very bad — taste, and it is possible that such water could be poisonous. The safest course is to use chunks cut from these plants to charge a solar still.

The total amount of water strained or sucked from a single water-bearing plant will be 2D x .1 liter (between .2 and 1.2 liters). The referee is responsible for creating the physical description of the plant, and for determining its frequency and location. A roll of 2D is made to determine whether water from such plants is fit to drink. Natives, of course, will know whether or not it is safe to drink such water.

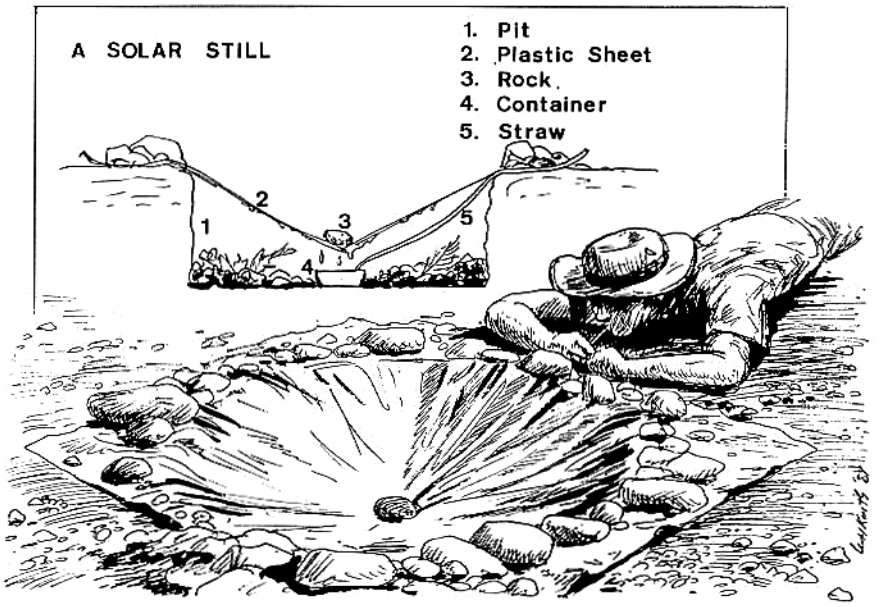
VEGETATIVE WATER QUALITY

Roll	Effects
2-3	No taste.
4-5	Unusual taste.
6-7	Unpleasant taste.
8-9	Extremely unpleasant taste.
10	Bad taste, and causes vomiting. Characters accumulate 5 extra Endurance Loss Points that hour.
11+	Poisonous, causes 2D damage points to any who drink it; on a separate 2D roll of 10+, the liquid will taste good.

Native water stores: On worlds with native inhabitants, especially if those inhabitants are at tech level 2 or less, it may be possible to find stores of water cached by natives against future need. These will be very well hidden; usually, they can only be discovered if the party observe a native hiding them, or if one of the party is himself a native; or if one has Desert Survival skill acquired on that planet, so that he is familiar with the natives and their ways of marking hidden water stores.

The water may be sealed in native pottery, or in stranger containers such as the eggshell or part of the anatomy of a large bird or animal. The manner of storage, and the amount of water recovered is up to the referee; also up to the referee is the natives' response to strangers stealing what will almost certainly be their most precious possession.

Solar still: A solar still can be easily constructed from simple and light weight materials. A pit is dug in the sand up to .5 meters deep and 1 meter wide. An open container of some kind, to collect water, is positioned in the center of the hole, and a plastic sheet (it should be transparant to be most effective) is laid across the top, anchored around the edges with rocks or dirt from the excavation. A stone or other weight is placed on the plastic above the container to force the plastic into a cone shape; in hot climates, the stone should be wrapped in cloth, plastic, or some other insulator to keep it from melting through.



Water in the ground is evaporated quickly within the greenhouse effect under the sheet. Beads of condensation rapidly form, which trickle down the plastic cone and drip off into the container. Water collection is particularly rapid if the still is 'charged' by adding moist material to the pit before it is covered, such as the pulp from water-bearing plants, moist sand or clay from a damp spot in an arroyo, or mud from an otherwise brackish waterhole (poisonous water can be purified in this manner, but not water contaminated by microbes — only boiling will kill germs or microscopic parasites).

To avoid disturbing the set-up, it is handy to have a long, slender tube which can be inserted and left in the container like a straw, allowing people to drink without dismantling the plastic.

It will take 10 x 10 minutes of work to dig the pit and set up the still. Water will begin to form 2 hours after it is completed.

In extremely dry regions, where it has not rained in many months or years, and in sandy or stony areas, only a few mouthfuls of water can be obtained with a still. In regions where it has rained recently, in semi-arid grasslands, and when impure water or moist plant material can be added, a solar still will produce 2 liters of water per day. Stills should not be made larger than about a meter across, for this would reduce their efficiency. A number of stills can be constructed, however, to increase the yield of water. The referee will have to use his judgment about the actual amount of water which can be collected in this way; obviously, 2 liters of liquid will not be extracted from a handful of mud. The referee should make a rough guess as to the total amount of liquid which might be held in the material used to charge the still, and allow one half that amount to be collected during the first day, half of what remains on the

second day, and so on until the characters give up, or until the still is charged with more moist material.

Obviously, a solar still will not provide all of a man's water needs, but it is very useful for extending his water supply, and for retarding the accumulation of Endurance Loss Points.

Rainstorms: To state the obvious, it rarely rains in the desert. In some, it may never rain, or it may do so once in many years. Areas of less extreme environments, however, may enjoy periodic rainfall. Animal and plant life in these deserts are adapted to the infrequent rains; seeds may lie dormant for many seasons before sprouting with the coming of moisture, and numerous species of animals live most of their lives buried in baked-solid dried mud from which they emerge to mate and reproduce only after the rain disolves their prisons.

The referee must determine if rain is even possible during the course of a desert adventure. Usually (and particularly if natives of the planet are around to provide information), the adventurers will be aware that it is the rainy season, if there is such in that area. The stage is then set for a desert rainstorm at the referee's discretion. He should avoid, if possible, arbitrarily rescuing the players from death of thirst by having it rain on them — though this is certainly a possibility if there is no other way to save otherwise promising characters! Characters prepared with suitable containers can capture as much rainwater as they need, and more will be available after the rain in pools and streams.

Within 24 hours of a desert rain, the desert will be transformed by rapidly growing and blooming plants. Animal life will be abundant, too, particularly in and around standing pools of water. Some pools may survive for a month or more after a hard rain, and many animals depend on them for continuation of their species.

Desert rains also bring special dangers to desert travellers, which are discussed in detail in the section entitled **Danger in the Desert.**

Technology: Modern technology can be applied in many ways to overcome the absence of water in the desert. Some of these are discussed in the section on Equipment, and include such items as stillsuits, fuel cells, vaporators, hydrogen engines, and fusion stills. All of these options suffer to one degree or another from their weight, clumsiness, cost, or likelihood of breaking down. They are, however, particularly useful within or near high-tech settlements, or aboard exploratory vehicles.

FINDING FOOD

The need for food is basically unchanged in the desert from any other wilderness area, and in most **Traveller** adventures will be met with preserved rations or concentrates. Hunting skill may be used to bring down edible game, and food will be available for sale or barter at any native settlement.

Characters with Desert Survival skill will know that eating foods high in protein (such as meat) requires more water to eliminate nitrogen

from the body, and increases the body's water needs. Characters will accumulate 1 extra Endurance Loss Point every hour during the day **after** they have a large meat meal (more than would be had, say, in a typical ration or concentrate meal). This loss is encurred the **same** day they eat heavily salted food, and meat which has been salted as a preservative will cause the increased loss for two consecutive days. This is because extra water is required to keep the body's tissue and fluid electrolytes balanced. Continual loss of salt through perspiration can cause muscle cramps, and for this reason salt tablets are usually included in desert survival gear. **Traveller** referees can usually ignore this, since adequte salt will be provided by normal rations.

SHELTER

The third requirement in consideration of survival is shelter. Shelter of some type, even if only shade by a large rock, is absolutely necessary for enduring the heat of the desert sun. Crevasses in rocks, cliff overhangs, and caves are better yet, though there is always the problem of dangerous desert animals having the same idea as you. In the desert, shelter is necessary to escape the sun, as protection from wind and sand when both begin to blow, and for warmth during cold desert nights. Many different types of portable shelters are available, and some are described in the **Equipment** section. Human ingenuity can turn a remarkable variety of materials into portable sunshades or windscreens. Any sunscreen will reduce the actual temperature by 5°C for a character, and some technological products can be quite effective at keeping travellers cool. At night, the temperature can be raised 10°C by digging down into the sand; proper warm clothing, or using heat-reflective blankets or materials can increase this effect considerably. More information is given in the **Equipment** section of this booklet.

NAVIGATION

If a planet has a magnetic field (not a certainty) and if the players have magnetic compasses, desert navigation becomes a relatively straight-forward task. Likewise, if the characters are familiar with the world's rotation and know the approximate latitude of their position, they can use the local sun or stars to set a straight course, since clouds rarely block the desert sky. None of this information needs to be worked out in detail by the referee, and usually it will be set by the requirements of a particular adventure; if the referee wants the players to be lost in the desert, he can arrange for their inertial guidance system to be broken, their magnetic compasses to be useless on that world, and for no one to have a clear idea of which direction to go, even if they can see the sun and stars.

In this case, players may have an **approximate** idea of which way a particular goal is, and roughly how far; the crew of a crashed spacecraft might, for example, know that the starport they were headed for is somewhere off toward the rising sun, at a distance of some two or perhaps three hundred kilometers. It is necessary, then, for them to steer a straight course across the desert in the indicated direction. This

usually means taking a bearing on some prominent terrain feature directly ahead or behind and keeping it there as they walk (keeping a landmark on the right or left is a good way to proceed in circles, unless the landmark is extremely distant).

If the players have a map of the area, they can use **orientation** to roughly plot their position — possible if they can see two landmarks, widely separated and both shown on the map (one landmark may be a navigational aid, such as the point of sunrise, if it is known on the map).

Many lost-in-the-desert **Traveller** adventures can be enjoyed as the referee follows the adventurers' course on his map, modifying their course and position according to what the players tell him they are doing. As always, the referee may guide or suggest ideas to any characters within the party with Desert Survival skill. In some cases, characters with Navigation skill may be expected to have vital information, such as direction of sunrise, latitude, or star positions.

A waterhole — or even a large oasis — is a tiny target in the midst of a desert's immensity. Once a party enters the area where the target is located (whether or not they **know** they've entered the area), whether or not they find it depends mostly on how large that target actually is.

When the referee is using the convenient 1hex:1km scale for following the travellers' position on a map, the following table can used to determine how close the party must be to see a particular landmark or destination.

SIGHTING IN THE DESERT

Target or landmark	Distance at which seen
Waterhole without vegetation	Roll 9+ on 2D to see it within 1km or less; not spotted at greater distances.
Single vehicle or building	Definitely seen at 2km or less — roll 9+ on 2D to see it within 5km.
Small oasis or settlement	Definitely seen at 5km or less — roll 9+ on 2D to see it within 10km.
Large oasis or village	Definitely seen at 10km or less — roll 9+ on 2D to see it within 20km.

The 2D roll to see a given target can be made every other 10 minute period while the characters are within the range given for where they **might** see it, and **any** time a character states that he is specifically looking for the target. There is a DM-1 for each 3 Endurance levels a character has lost at that point, **and** a DM-1 for every Intelligence level he has lost (see the section entitled **Loss of Mental Faculties** in the chapter on **Danger in the Desert**).

Terrain features such as buttes, mesas, and very large cliff or rock formations can be seen across 20 or 30 kilometers. Streams, rivers, and canyons (when approached from the side) may not be seen until they are

quite close — say, within a kilometer or two — unless they are surrounded by vegetation, in which case they can be seen as if they were a large oasis. If a stream or canyon cuts across the party's line of march, however, there is no question that they will run into it eventually; it is quite possible to walk right past a waterhole, however, and never see it.

Signals from radio beacons, broadcast stations, or navigation satellites or orbiting spacecraft are good navigational aids if the party has the proper equipment for receiving them. Some radio directional devices are listed in the **Equipment** section of this booklet.

DEALING WITH NATIVES

If intelligent natives inhabit the desert region a **Traveller** party is visiting, things can be either (or both!) vastly simpler or more complex. Natives — whether they are wandering nomads or inhabitants of a desert village, town, or city — imply accessible stockpiles of whatever the travellers might need, including food, water, clothing, shelter, weapons, transportation, and guides. Locals will have clothing adapted to local conditions, and will have a store of lore and folk wisdom which can help strangers survive in an unfamiliar environment.

At the same time, of course, natives create the possibility of attack by intelligent and hostile adversaries. Nomad cultures, shaped by conditions that favor survival of the strong, often glorify strength, dominance, pride, and self-reliance; they may (though rarely) attack any strangers who invade their domains, or they may attack because they are desert bandits who survive by plundering strangers. The inhabitants of a village or city will become hostile toward any stranger they consider a threat.

The usual rules controlling encounters with local NPCs, including rolls on Reaction tables when appropriate, should be used to govern encounters with desert natives. Often, the adventure itself will revolve around one or more desert cultures, and the referee will already know whether the natives are friendly or otherwise. It should be noted that primitive natives (tech 3 or below) will nearly always barter almost anything the off-worlders want in exchange for metal and modern weapons. In extremely arid conditions, water may become priceless, something shared or earned or owned jointly with the rest of the community, but not, strictly speaking, for sale. In other cases, water may become the currency base against which all other values are judged, and the medium of exchange which buys anything else. Salt, another necessity in the desert, may also become currency — though rarely to the same degree as water. If possible, travellers planning on visiting an inhabited area should become acquainted with the culture first, through library research or conversations with people who have been there. In particular, the customs, outward moral conduct, and (especially!) taboos of the natives should be studied in order to avoid accidentally offending someone and starting a fight or worse. A general knowledge of the local economic system — do they barter, or trade, water, gold, palm leaves, or whatever? — may also be invaluable.

TRANSPORTATION

Getting across a desert is much easier with some form of transport. For an expedition mounted by a technical civilization, transport usually means vehicles — air/rafts, ATVs, or even a traditional landrover or jeep. These are invaluable for exploring desert country, since cross-country travel time is reduced, it is possible much larger stores of water and other necessities, and the vehicle itself represents portable shade or even enclosed or air-conditioned comfort no matter how empty and inhospitable the terrain.

Unfortunately, vehicles also offer more opportunities for things to go wrong. They can go deeper into dangerous territory, leaving survivors of a breakdown or accident in far greater peril than otherwise.

The chance of mechanical failure varies with tech level and whether or not the vehicle was designed for the local environment. This chance is determined by creating a number against which a periodic 2D roll is made for mechanical failure.

Native vehicle: If the vehicle was designed and built in or near the local desert, the following formula is used:

2D-4 + Tech Level

Vehicle designed for desert work: If the vehicle was specifically designed for desert work in a desert type other than the one in which it is being used (either on the same world or another world), the following formula is used:

2D-5 + Tech Level of builders

Vehicle from elsewhere on planet: If the vehicle was brought to the desert from somewhere else on the planet, the following formula is used:

2D-6 + local Tech Level

Vehicle from different planet: The formula for vehicles brought from off-world (if not covered by previous descriptions) is:

2D-7 + Tech Level of builders

In each of these cases, 2D are rolled against the resulting value — usually once on each day the vehicle is used, though the referee may decree that the roll be made more or less frequently, depending on the situation. If the result is greater than this value, the vehicle has suffered a mechanical failure of some kind. What this value is, and how it affects the adventurers, is, of course, up to the referee and the actions of the players.

These formulas are not used for (relatively) non-mechanical forms of transport, such as wagons, animal-drawn carts, or the like; rather, they apply to mechanical contrivances using engines and/or numerous moving parts.

Characters with Desert Survival skill as well as Mechanical skill may have some advantage in repairing vehicles under desert conditions (see Normal Skills).

Several desert vehicles are described in the Equipment section in greater detail.

ANIMALS

Primitive desert cultures very often use animals for transport, and, indeed, some cultures are centered on the breeding and raising of these animals. While every culture encountered may not have the local equivalent of the Arabian horse or camel, referees interested in creating complete, comprehesive, and interesting desert environments should give some thought to them.

The form of the animal is left to the referee's imagination. Prepared adventures set in the desert will often give the information for native creatures with an eye towards their use as pack or riding animals.

It is important to remember that in all but the most alien cases, domestic animals will need water too — usually much more than humans. The amount can be calculated by dividing the animal's mass by 100kg, and multiplying the result times 5 gallons or 20 liters. This is the amount of water needed per animal per day to keep it healthy and in top efficiency. An animal's Endurance can be determined by rolling 2D+2. This number (which is the same for all animals of the same species) or less must be rolled on 2D; the roll is made once per day, and there is a DM+3 if the animal has had no water at all that day, DM+2 if it has had half as much as it was supposed to, or DM+1 if it had more than half, but less than the full amount. There is also a DM+1 for each day the animal continues to go without any water at all. If the modified 2D roll is greater than the animal's Endurance, the Endurance level is dropped by 1 for the next Endurance roll. When the animal's Endurance reaches Ø, it is dead.

The referee is free to imagine truly alien riding beasts (such as giant creatures which eat sand, and to whom water is poisonous), but he should introduce them carefully, and with restrictions, to keep desert crossings from becoming too easy. One of the most difficult decisions to make in desert crossings is when to stop providing water to animals or vehicle radiators, because humans need it more.

Travel by animals in the desert is rarely much faster than travel on foot; while riding animals are faster, generally, than people, no animal can maintain such a pace for long in the desert and survive. The advantage of riding is that animals (which are adapted to travel in local conditions) can carry characters across varied terrain, allowing those characters to ignore the multipliers which reduce distance covered and the accumulation of Endurance Loss Points for terrain (ELPs are still accumulated for all other factors, of course).

Animals can also carry heavier loads of water and supplies than can a man. The usual maximum load an animal can carry is one half its body weight, though the referee may specially design animals capable of carrying a larger percentage; animals forced to carry more than half of their maximum amount will lose 1 Endurance point each day they do so, in addition to other losses. For example, a riding animal weighing 400kg (about the same as a horse) can carry a maximum of 200kg. It can carry up to 100kg without suffering Endurance loss.

Other capabilities — such as the animal's speed in a charge or whether they have weapons useful in mounted combat — are up to the referee, and can be handled using basic **Traveller** animal creation rules.

Danger in the Desert

A careless or thoughtless traveller can come to grief in quite a few ways in the desert. This section lists some of the most dangerous problems which can arise, how they come about, and what the characters can do about them.

LOSS OF MENTAL FACULTIES

Characters suffering from extreme thirst and exhaustion can run into real trouble as critical and analytical abilities vanish, and hallucination mingles with reality. Every time a character suffers the loss of 1 Endurance level, he **also** loses 1 Intelligence level, then rolls 2D against his **new** Intelligence level; if the result if greater than the new level, his Intelligence level will drop by one more.

When a character's Intelligence drops to half its original level (fractions rounded down), the character will have trouble concentrating, speaking, or making decisions. Naturally, it will be more difficult for him to make any saving rolls against his Intelligence which might be required. He may also tend to become hysterical, lapsing into helpless giggles or fits of laughter when frustrated or even simply spoken to.

When a character's Intelligence level reaches Ø, he may be considered to be totally irrational — driven mad by thirst and heat. He may attack other characters for their water, or for no reason at all. He may or may not be able to use weapons or tools. He may wander off into the desert during midday, or he may withdraw into himself and not respond to any external stimulus. Desert travellers have been found, dead of thirst, with their tracks showing that they'd crossed several streams along the way, but never seen them. The player may continue to role-play such a character, or the character may be taken over by the referee as an NPC, at least until he recovers.

Recovery requires hospital care — at least 2D + twice the number of Intelligence levels lost, in days to return the character's Intelligence to its former value. This recovery will prove impossible if a 2D roll gives the result of 10+; there is a DM+2 for each full day the character has had an Intelligence level of Ø, and DM+1 for each full day his Intelligence was at half or less than its usual value.

MIRAGES

Mirages are familiar to all desert travellers. They are **not** a sign of loss of mental faculties, but characters already suffering the mental effects of heat and thirst may well misinterpret them. Mirages are caused by the diffraction of light rays through dense layers of air close to the desert floor; they may be images of landscapes far distant which seem much closer, distorted, or even inverted. The most common type is a

reflection of the sky which creates a shimmering blue or silver image that can be mistaken for a pool of water.

Mirages occur as a result on an event table, or the referee may introduce them to liven up an otherwise dull stretch of hiking. They are also useful for refereees who wish to sidetrack or delay their players temporarily.

Travellers with no desert experience may be fooled by a mirage if a roll of 2D+2 exceeds their Intelligence level. Travellers with Desert Survival skill simply roll 2D against their current Intelligence level, and may use their skill level as a **negative** DM. Characters with Intelligence levels already reduced to less than half of their normal value suffer a further DM+2. If the modified result exeeds the character's current Intelligence, the referee should tell him that he sees water in the distance; this illusion will seem to recede as he travels towards it, and he must roll his current Intelligence level or less in order to decide that he is following a mirage.

The roll against Intelligence is made for each member of a desert-wandering party. The first roll is made for one of the characters picked at random. If he believes the mirage to be real, the roll made for the **next** character has a DM+1; if **that** character accepts the illusion, the next roll has a DM+2, and so on for each character until all characters have been rolled for, with a maximum of DM+4. This simulates the very real power of suggestion people can exert to one another in such conditions.

SUNBURN

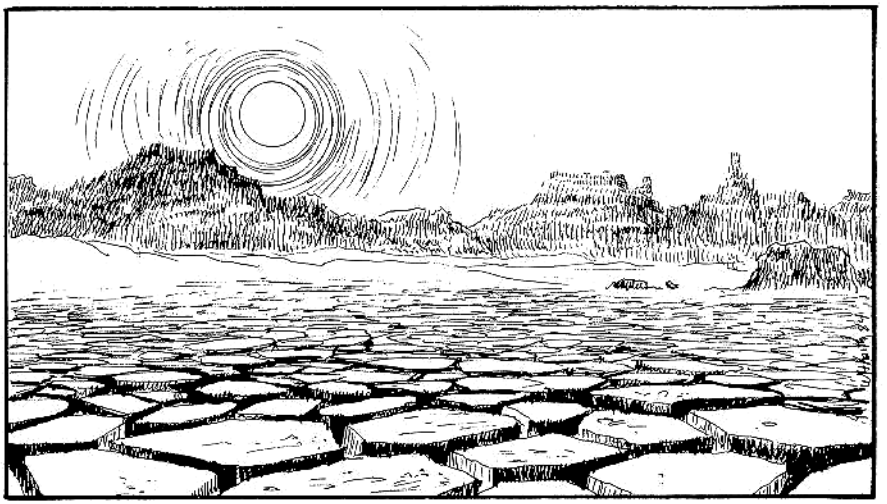
Sunburn aggravates dehydration. Characters who suggest to the referee that they are going to remove their shirts in an effort to get cool can be allowed to do so (though characters with Desert Survival skill Ø or better will know better, and should be warned by the referee).

Characters who do not wear hats or take advantage of some other type of sunscreen during hours between mid-morning and mid-afternoon, and characters who wear short-sleeved shirts or no shirts at all will become sunburned, and suffer 1D damage. The number of damage points lost also becomes the number of extra Endurance Loss Points accumulated each day for 1D days after the burn occurs. It is possible for characters suffering from burns to get **more** sunburn, and have the effects accumulate.

Characters can avoid sunburn by wearing hats, wearing loose but long-sleeved shirts and long pants, and by remaining out of the direct sun as much as possible.

HEAT CRAMPS

Cramps can be brought on by lack of salt in conditions of extreme heat and physical labor. Survival rations contain the salt necessary to forestall cramps. Characters who are not eating packaged rations, however, or who engage in heavy work (such as digging, for water or to



make solar stills) may lose so much salt that cramps can incapacitate them.

Cramps will strike a character on a roll of 10+ on 2D during any period of physical exertion in temperatures of 35°C or more. They are **immediately** relieved by salt tablets or a saline drink. Until they are relieved, the character cannot walk and will be in considerable pain. If untreated, cramps can cause 1D damage points per hour, resulting eventually in unconciousness. Unlike damage suffered by wounds, this damage can be reversed by proper treatment — rest, water, and salt.

HEAT EXHAUSTION

Heat exhaustion is a common problem for any characters exerting themselves in temperatures of 35°C or more. A 2D roll is made for heat exhaustion for each character during each period when they are working or walking in the sun; there is a DM+1 for each 5° over 35°C. On a modified roll of 10+, heat exhaustion will set in.

The character will become extremely tired, and complain of headache, dizziness, and nausea. His pulse will become weak, and his skin will be moist and clammy. If untreated, he will have to begin making 2D rolls against current Endurance, once every 5 minutes. If the roll exceeds his current Endurance, he will become unconcious, and remain so for 1D x 30 minutes. When he comes to, he will still have the symptoms of heat exhaustion, and must continue rolling against Endurance every 5 minutes. Each time he becomes unconcious, his Endurance will drop 1 level; when it reaches Ø, he will be in a coma, and cannot be awakened without medical treatment.

Heat exhaustion may also set in with cramps. Any character who begins suffering from either heat exhaustion or heat cramps should **immediately** roll for the other condition, and apply a DM+1. Thus, a character who rolled an 11 on a roll for heat exhaustion would **also** roll

2D+1 for cramps, which he would suffer with a modified result of 10 or more.

Treatment consists of sitting in the shade and resting, and drinking plenty of water (up to 1 liter or so). Salt or salt solutions will relieve cramps.

HEAT STROKE

This is the most serious of the heat stress problems described here, and can cause rapid death. Characters with heat stroke will suffer a sudden rise in skin temperature, with temperatures as high as 105°F or more; sweating increases, and the skin feels hot and dry. They will collapse, become disorientated, and possibly delirious.

Again, players roll 2D for their characters during each period of work or walk exposed to temperatures above 35°C. There is a DM+1 for every 10 degrees above 35°. Heat stroke occurs on a roll of 12 or more.

Characters suffering heat stroke will **immediately** lose half of their remaining Endurance levels and half their remaining Intelligence levels. They will lose 1 additional Endurance level each hour they are untreated. When their Endurance reaches Ø, they are unconcious; at this point, on a 2D roll of 9+, they will go into convulsions which cause an additional 2D damage. They will continue to lose 2 additional damage points each hour after that until they are dead.

Treatment is to cool the victim as rapidly as possible. Immersing him in cool water is best, though this is admittedly difficult in desert conditions. Soaking his clothing with at least 1 liter of water and fanning him vigorously to promote cooling through evaporation may work. Further loss of Endurance levels wil be stopped on a 2D roll of 7+ with immersion, or 9+ with soaking and fanning. Once Endurance loos is stopped, cooling must stop, or shock (the conditions described above under heat exhaustion) will set in. The character will remain at this new Endurance level until he can be placed under hospitalization for treatment.

Note that the symptoms described above for heat stress problems (cramps, heat exhaustion, and heat stroke) should be described to those players whose characters are suffering from the indicated condition, so that the players can act out their character's illness. Other characters must then base their actions on the symptoms described, rather than having the referee tell them that one of them has heat stroke. Characters with Desert Survival skill 1+ and characters with Medical skill 1+, can be expected to recognize the above symptoms for what they are, and should be guided, if necessary, by the referee.

FLASHFLOODS

It seems strange to discuss the risk of drowning in the middle of a desert, but many people have lost their lives in just this way. The dry streambed features known variously as dry washes, arroyos, or wadis are formed by rushing water during the infrequent desert rains. Their level,

soft sandy bottoms make them attractive places to camp — doubly so since water can sometimes be found not far underground. These channels can fill with raging torrents of water with almost no warning; rain many miles distant in the mountains can create a flood in a dry streambed with the sun shining.

The possibility of a flashflood is remote — so remote that no die roll values can be given for the possibility. Their occurrence is left to the referee, who must take into account such factors as the time of the year (rainfall will be most likely in early spring), whether or not water is abundant elsewhere on the world, and whether or not there are mountains or hills in the distance from which the torrent could flow.

Warning signs of a flashflood — all significant to characters with Desert Survival skill 2 or more — would be heavy clouds over the mountains (perhaps on the horizon), or the sound of distant thunder.

Characters caught in a gully by a flashflood are knocked down and immediately suffer 1D damage points. After that, **each** character is required to make 1D-2 rolls against Strength **and** against Endurance. A character who rolls higher than his Strength at any time will have lost his grip on whatever he was clinging to, be swept downstream, and suffer 2D more damage points as he goes. A character who rolls higher than his Endurance has gone under and is in danger of drowning; he immediately loses half of his remaining Endurance levels.

Any character whose Endurance is reduced to Ø is unconcious and will most likely drown. Characters may help other characters who have failed one or another of their saving rolls by making an extra **two** saving rolls against their own Strength, one for them, and one for the person they are trying to rescue. If the roll for themselves fails, they lose their grip and suffer 2D damage, as described above. If the roll succeeds, they will be able to grab the other character, but will be able to hold onto him (saving him from the effects of his failed saving roll) only if they roll less than their Strength on the second roll as well.

The ability to swim (described in Gamelords' **Traveller** supplement, **The Undersea Environment**) does not help in this situation. As an optional touch of realism, however, the referee may apply a DM+1 to the saving rolls of any character who cannot swim, to simulate their panic at suddenly being engulfed by so much water.

A party may encounter an arroyo which flooded while they were (fortunately) elsewhere. An attempt may be made to cross flooded streambeds if the characters are desperate enough by following the instructions given above; the characters do **not** get knocked down and suffer an immediate 1D damage point loss, however. They will fall the first time they fail a roll against their Strength. They do not need to roll against their Endurance until they have been knocked down. If the party elects to join hands and attempt to cross in a chain, a character who falls may be saved from falling by having each person holding on to him roll against their own Strength levels; these rescuers do not need to roll against their Strength twice (since they already have a hold on their comrade), but make a single roll to keep him from falling.

Once any character falls in an attempt to cross a flooded stream, he must make the 1D-2 double saving rolls against Strength and Endurance until he makes it ashore (if the referee judges that the fallen character was almost across when he was washed away, he may require only a single set of rolls against Strength and Endurance).

BLINDNESS

Characters with unprotected eyes may find themselves temporarily blinded by the unrelenting glare of reflected light. Characters out in the desert between mid-morning and mid-afternoon should roll 2D once each day if they have no protective goggles; blindness will occur on a roll of 11+, and will last 2D hours. Characters on salt or mineral flats have a DM+2 added to the roll; the reflected light from a salt bed is brighter than from sand, and there is the added danger of salt blowing into the eyes and burning them.

Blindness is temporary, but may incapacitate characters at a critical moment, preventing them from seeing water, rescue, or approaching enemies.

SANDSTORMS

Characters with Desert Survival skill of 1 or better will be able to warn of the approach of a sandstorm by pointing out a mist of suspended dust and sand a meter or two above the desert floor. The mist clears, but the sand remains suspended, resembling a vast, thick, rolling carpet which seems to glide across the desert.

Sandstorms are rarely more than 2 meters deep; the air above them is clear, and people walking about in one may appear to be wading chin-deep in water. Heavier, coarser sand never rises more than .5 meters from the ground, and it is here that wind-blown sand causes the most problems. Characters with their feet unprotected by boots or sturdy desert clothing may suffer 1D-2 damage points from the abrasive effects of the sand.

On small planets with lower gravity than Earth, the sand can be moved at higher speeds by the wind, and lifted farther into the atmosphere. For every size code in the planet's UPP less than 8 (Earth's size), the sand can rise an additional 1 meter into the air; the thickness of the atmosphere does not affect windblown sand, which can occur even on worlds with trace atmospheres (Mars is an example).

Characters who cannot get their heads above the sand cloud may have trouble breathing; they will begin receiving 1D damage points every ten minutes until they are out of the cloud, with a DM+1 for every level in the world's UPP size code less than 8 (i.e., DM+3 on a world of size 5). Characters in enclosed shelters can sit out a storm in comfort — but will find themselves buried under 1D-3 meters of sand when they emerge, and be forced to dig their way clear. Of course, filter and airmasks will protect characters from smothering in the sand. Climbing to high ground, if possible, will also let a character escape the sand cloud, though if the

rise is gradual (such as a hill or sand dune) instead of steep (such as a boulder or rock column), the sand will simply flow up the hill after him. The referee should use his discretion in such cases.

Sandstorms may be over in a few hours, but have been known to last for days. Their length should be determined by the referee, depending on the requirements of the adventure. They are not particularly common, and are given here as a rare event which the referee may introduce to an adventure at his discretion.

DUSTSTORMS

Duststorms are not sandstorms. Sand, being heavier than dust, cannot rise far above the desert floor, but a duststorm can fling suffocating clouds of dust hundreds of meters into the air.

Warning is given to characters with Desert Survival-1 or better by an approaching blue-black cloud rolling across the sky, and flowing over the landscape. There are no abrasive effects as with sandstorms, but characters caught in duststorms will have trouble breathing, and will take 1D-2 damage points every 10 minutes they are exposed without protection. A cloth tied over the mouth will change this to 1D-2 damage points every 30 minutes, and a filter or airmask will offer complete protection. Duststorms will not bury characters inside shelters or vehicles as sandstorms will; but, like sandstorms, they can last for days (their length should be dictated by the requirements of the adventure).

VEHICLE BREAKDOWN

Even the most modern technology can fail, leaving one stranded. The formula for determining the chance for a vehicle breaking down is given in the section entitled **Transportation.** The appropriate 2D roll should be made once each day the vehicle is used, and also each time the vehicle is put under severe stress — such as driving over rough and rocky ground, or during or after a sandstorm.

Vehicles described in basic **Traveller** run on batteries or small fusion plants, and do not require water to cool them as do primitive internal-combustion engines. In some cases, such as when a local culture has a tech level of 5-8, large quantities of water (1 to 6 liters) may be necessary for the operation of locally produced vehicles. Since these will be exceptional cases, details are left up to the referee.

Characters with Mechanical skill may be able to repair broken vehicles; their attempts may be modified by whether or not they have Desert Survival skill and hence are familiar with the special problems of repairing equipment in the midst of desert sand.

A special form of vehicle breakdown may include having the vehicle become trapped in soft sand, a particularly common problem in erg terrain. Sand firmness varies with time; sand which can be driven across without problems one day can be impassable the next. Vehicles may become trapped in very soft sand on a roll of 9+; tracked vehicles become trapped on a roll of 11+. Freeing them requires a roll of 9+ with a

DM+Driving skill, and a DM+2 for blankets or planks brought along to provide traction for the wheels.

DRUMSAND

'Drumsand', 'barking sands', 'thrumming sands', 'singing sands', and 'booming sands' are five of the many names for an unusual phenomena which occurs very rarely in erg terrain, and is not, by itself, a danger. In some way not understood, sand disturbed by animal or human passers-by is set into vibration, causing very large areas of sand to resonate and echo, creating a reverberating sound like thunder, barks or chirps, whining or shrieking, or booming; sometimes these sounds are so loud that people must shout to one another to be heard. Drumsand can be an inconvenience, however, if the characters are trying to remain inconspicuous with enemies nearby, or if dangerous animals are attracted by noise. The sound, once begun, will last 1D minutes.

Drumsand is a very rare event, introduced only once in a very great while by the referee. The position of drumsand in a given area should be noted, however, since the effect seems to associated with particular areas.

ENCOUNTER AND EVENT TABLES

The referee should prepare event and encounter tables in the usual way for **Traveller** adventures set in desert. Separate tables should be prepared for different types of terrain (hammada, erg, reg/serir) and should take into account whether or not the party is using vehicles, whether or not there are natives on that world, and other factors which might create interesting encounters. Some examples are given below.

EVENT TABLE
(Travelling by ground vehicle in hammada [rough] terrain)

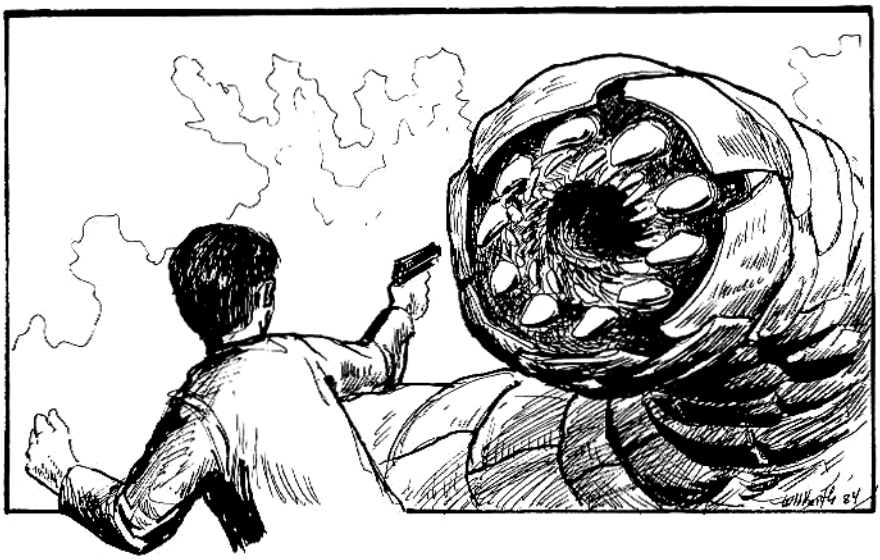
Die roll	Event
2-7	No event
8	Animal encounter
9-10	Vehicle breakdown: the nature of the breakdown should be determined by the type of vehicle and conditions, but it will strand the party for 1D-1 hours.
11	Rockslide: a landslip is triggered as the vehicle moves along the base of an escarpment. The vehicle will be damaged (requiring at least 1D hours to repair) on a roll of 10+. Characters riding or walking outside should each make a saving throw of 8+ to avoid 2D damage from falling rocks.
12	Attack by natives: local nomads catch vehicle as it passes through a narrow ravine, using dislodged boulders to trap their quarry. At least 2D+4 natives are in the attacking party, on both sides of the ravine. An animal encounter can be substituted for hostile natives, if appropriate.

Encounter Table for DESERT (hammada) TERRAIN

Die	Animal	Weight	Hits	Armor	Wounds and Weapons		
2	1 Trapper	50kg	18/ 6	none	15	as pike	A0 F3 S1
3	1 Pouncer	100kg	23/ 7	jack	10	claws+1	A0 F0 S2
					4	teeth+1	
4	5 Killers	25kg	15/ 4	none	8	claws+1	A4 F6 S1
5	1 Gatherer	200kg	21/16	none	13	thrasher	A8 F6 S2
6	4 Intermittants	50kg	16/ 7	none	11	hooves & teeth	F4 A9 S2
7	1 Pouncer	100kg	23/ 7	jack	10	claws+1	A0 F0 S2
					4	teeth+1	
8	1 Intermittant	3kg	4/ 1	none	6	teeth-7	A4 F4 S2
9	1 Gatherer	200kg	21/16	none	18	thrasher	A8 F6 S2
10	7 Flying Carrion Eaters	3kg	5/ 2	none	12	claws&teeth-4	A4 F6 S1
11	Event — Sandstorm. Storm approaches at speed 2, will continue for 10 hours. To escape, party must button down inside vehicle, or climb rock columns or cliffside to get above cloud.						
12	1 Siren	12kg	4/ 8	none	11	as pike	A0 F9 S0

The event table serves as a model for events which the referee can create depending on the exact situation. Rolls can be made on such tables periodically — usually once or twice daily.

The animal encounter table was created using basic **Traveller** rules for generating animal encounters; a planet similar to Earth in size and atmosphere was assumed, and the table was created for lifeforms dwelling in the badlands (hammada) type terrain. The referee will want to create a number of tables for each world for different areas, different terrain types, and even different times of the day or year.



Following is a list of equipment useful in desert conditions.

Goggles: Lightweight, plastic eye goggles which provide protection against both windblown sand or dust and sunglare. More primitive versions (which will not reduce glare and provide uneven protection from sand) may be available at lower tech levels. Tech level = 5+. Reliability: NA. Weight: Negligible. Price: Cr15.

IR Goggles: Allow wearer to see exothermic (heat-emitting) sources in the dark such as animals, fires, or hot engines. IR goggles also provide protection from windblown particles. Tech level = 6+. Reliability: Tech Level+1. Weight: 250gm. Price: Cr500.

LI Goggles: Light intensifer devices allow the wearer to see in darkness so long as there is at least some light (even as little as that available on a dark, overcast night). They also protect the wearer's eyes from windblown sand. Tech level = 7+. Reliability: Tech Level. Weight: 300gm. Price: Cr500.

Inertial Navigator: A small (10cm x 6cm x 1cm) inertial navigation computer which allows the user to backtrack on his path by 'remembering' movements and turns. It is switched on at the point from which the user sets out, and will allow him to find his way back from any distance. A simple math function can also allow the user to determine a straight line distance and direction to his starting point no matter where he is. Tech level = 8+. Reliability: Tech Level+1. Weight: 150gm. Price: Cr1500.

At tech level 10, the device becomes small enough to be worn on a wrist, costs half as much, and is of negligible weight.

Navigational Satellite: A small satellite placed in synchronous orbit over the hemisphere where exploration is taking place. It provides moment-by-moment information on the precise location of a tracking unit on the ground with an accuracy of 1 meter or less. For twice the size and price, the satellite can relay to the tracking unit (which is also about twice the dimensions listed below, and includes a TV-like viewscreen) a plot projected on an accurate map of the region, which is created by the satellite through a combination of laser and radar

mapping techniques. A small nuclear power plant provides over a year of operation without servicing, and the satellite can be retrieved and used over and over. Tech level = 9+. Reliability: Tech Level. Size (Satellite): 1 meter x .3 meter x .3 meter (tracking antennae unfold to 8 meter 'wingspan'). Weight: 100kg. Size (Tracker): 15cm x 10cm x 4 cm. Weight: 350gm. Price: Cr35,000

Desert Clothing: Rugged, lightweight clothing for use in the desert. Includes white, long-sleeved shirt; white, comfortable long pants, sturdy hiking boots; and a broad-brimmed, light-colored hat. Tech level = 3+. Reliability: NA. Weight: Negligible. Price: Cr95

Desert Survival Suit: Cover-all garment with shiny outer surface which prevents major water loss in the desert. The wearer is cooled through evaporation of perspiration, but a series of traps and chemical filters condenses and purifies lost body liquid, storing it as pure water in pouches within the suit. A hood, goggles, and breathing mask (which traps moisture exhaled through the nose and mouth) are included. The chemical filters must be changed once a month, at a cost of Cr50.

At tech levels 9-11, the suit reduces by 4 per hour the wearer's accumulated Endurance Loss Points, and will supply him with 1 liter of water every three daytime hours, and 1 liter every night.

At tech levels 12 and above, the suit eliminates **all** Endurance Loss Points **except** those due to terrain.

The suit has certain disadvantages. At tech levels 11 and lower, the wearer suffers -2 to Dexterity. Also, the suit is extremely shiny, making it almost impossible for the wearer to sneak up on anyone, even in rocky terrain. This last disadvantage could be an advantage for characters lost in the desert who are hoping to be spotted by aircraft. Exactly how the suit's high visibility affects an adventure is left to the referee, and will depend on the situation, the terrain, over-all visibility, and other factors.

In combat, the suit is treated as jack armor. Tech level = 9+. Reliability: Tech Level+1. Weight: 5kg at TL11 or less; negligible at higher levels. Price: Cr7,000.

Note that vacc suits and combat armor will also — by their very nature — provide **complete** protection for desert travellers, at least as long as their air supply holds out.

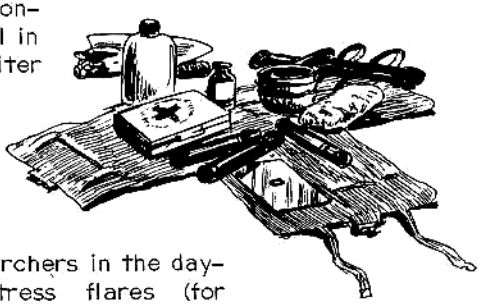
Protective suit: Similar to protective suits used for short periods in insidious or corrosive atmospheres. It is sealed, air-conditioned, and has its own air supply (good for 6 hours). The suit has no water supply of its own, nor will it protect the wearer once the air supply gives out, but so long as it works, the wearer will not accumulate any Endurance Loss Points **except** those for terrain. In combat, the suit is treated as jack armor. Tech level = 6+. Reliability: Tech Level. Weight: 7kg. Price: Cr1,000.

Native Clothing: Native populations living in desert conditions tend to develop fashions of clothing which will help them survive in arid

climates. The more severe the climate, the more extreme these adaptations to the environment tend to be. The flowing robes of Earth's Bedouin culture help circulate air and protect the wearer from the sun; a more extreme climate might result in the use of elaborate water-trapping garments (like the desert survival suit above), and masks which protect the eyes and prevent the loss of moisture through breathing.

The nature of native clothing will be up to the referee who is creating a particular native culture. In general, native clothing worn by **Traveller** adventurers will prevent the accumulation of Endurance Loss Points due to heat, but not those accumulated by lack of water or terrain. The referee should apply common sense here; desert dwellers also know better than to go out in the mid-day desert sun (only mad dogs and Englishmen . . .), and native dress will not help off-worlders in conditions which even the natives will not brave.

Tech level and reliability are not applicable. Weight and price vary.



Desert Survival Kit: A kit containing a variety of items useful in the desert. Includes a 1-liter canteen; first aid kit; salt tablets; folding shovel; plastic, watertraps, straws, and directions for building three solar stills; a knife and sheath; a signal mirror (for attracting the attention of searchers in the daytime); three hand-held distress flares (for nighttime use); and a water purification kit (see below). The kit comes in a 30cm x 12cm x 12cm pack which can be worn on the back or hip, or attached to a larger pack. Tech level = 5+. Reliability: NA. Weight: 1kg. Price: Cr450.

Water Purification Kit: A bottle of 250 tablets used to make water contaminated by micro-organisms safe to drink. One tablet dissolved in 1 liter of water will render the water safe within 30 minutes. Tech level = 5+. Reliability: NA at TL7 or higher; reliability equals tech level if tablets are more than 6 months old at TL5 or 6. Weight: Negligible. Price: Cr5.

Fusion Still: A bulky device which breaks water molecules free from material placed within it. The amount of water delivered will vary with the type of material fed to the still, but ranges from 1% for very dry sand to 70% for organic material such as wood, plants, or bodies. This percentage of weight in kilograms gives a one-to-one yield of water in liters (thus, 100kg of sand will yield 1 liter or water). The still require 1 hour to set up, and 30 minutes for each 10kg of material processed; the hopper must be cleaned out after each load, requiring 30 minutes. Tech level = 13+. Reliability: Tech Level-5 Size: 1 meter x .5 meter x .3 meter. Weight: 60kg. Price: Cr4,500.

Solar 'Vaporator: A device which collects moisture from the air, especially at night. Yield is 2 liters per 24 hours in standard or dense atmospheres, 1 liter per 24 hours in thin atmospheres, and .5 liter per 24 hours in very thin atmospheres. The 'vaporator is stored in a compact (50cm x 20cm x 20cm) package, but unfolds (an operation requiring 5 minutes) to 200cm by 10cm x 50cm, and stands on a tripod which takes up 1 square meter.

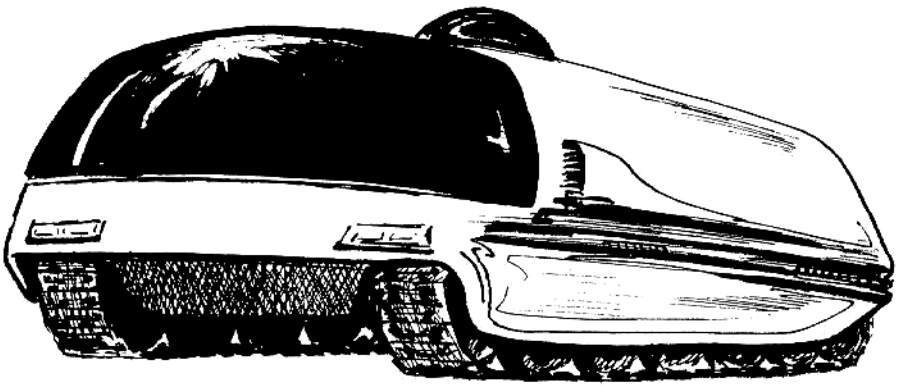
If the 'vaporator is not running throughout an entire 24 hour period, partial yields can be calculated by assuming that 3 times as much water can be collected at night as during the day (.5 liter during the day on a standard atmosphere planet, 1.5 liter at night).

Solar panels provide power directly during the day, and accumulate and store power for operation at night. Tech level = 10+. Reliability: Tech Level. Weight: 8kg. Price: Cr1,250.

Wheeled ATV (Land Rover): A rugged cross-country vehicle useful for desert travel. It has a speed of 100kph on the road or on smooth, open terrain; this is reduced to 20kph in soft sand, or in very rough terrain. Tech levels 6-7 use diesel, alcohol, or electric-battery driven engines to provide a cruising range of less than 1,000km. Tech level 8+ vehicles use batteries or small fusion power plants fueled with hydrogen or water. The vehicle may be pressurized, and holds up to 16 passengers or 3.2 tons of cargo (humans are equivalent to 200kg of cargo). It will comfortably carry up to 8 with adequate sleeping and eating facilities.

Rovers may be specially outfitted for military or scientific expeditions. Tech level = 6+. Reliability: Varies. Weight: 10 tons. Price: Cr30,000.

Tracked ATV: Similar in most respects to the wheeled ATV described above. It can travel on roads or open terrain at up to 80kph; in very rough or sandy terrain, it can make speeds up to 30kph. Though slower, it is generally more reliable than wheeled ATVs. Statistics for weight, range, and load are identical to the wheeled version. Tech level = 6+. Reliability: Varies. Price: Cr30,000.



Adventures in the Desert

The material presented in this booklet makes it possible for referees to simulate the hazards and challenge of adventuring in an arid environment. What the content of those adventures might be is, of course, up to the referee, but a few possibilities are outlined below.

SEARCH FOR THE LOST RUINS

A vast continental desert is rumored to hold the ruins of a fabulously wealthy vanished civilization, and a party of archeologists is preparing to explore a part of the desert never before visited. The adventurers may be hired as escorts to protect the party from hostile natives (who regard any and all ruins within the desert as the dwelling places of their gods). Or the adventurers themselves may be the entire expedition, lured into the desert by stories told over drinks in the local spaceport bars, of platinum towers and jewel-encrusted thrones.

SURVIVE!

The adventurers are aboard a shuttle which crashes into the desert some hundreds of kilometers short of the spaceport facility which was its goal. Each person aboard will have to roll for injury sustained during the less-than-perfect landing. The referee will determine how much water and food they have, and how clear a notion the group has in regard to the direction of, and distance to, civilization. Good luck!

BROTHERHOOD OF THE WASTES

Dakaar Minerals — a less than scrupulous corporation operating in the Reavers' Deep Sector — has mounted a campaign of extermination against the notorious Brotherhood of the Wastes, a human, nomadic tribe living on the fringes of a vast, planet-wide desert rich in various chemical salts and metals. The Brotherhood began a guerilla war against the many company outposts some years ago; it is rumored that Dakaar Minerals uses drugged natives as slave labor in its mines. The adventurers are approached by representatives of the Brotherhood; the nomads desperately need modern arms and men able to train them in their use. They want to stage a general uprising against the company, raid its mines, and free the slaves, for members of the Brotherhood prize freedom above all else, and will die rather than submit. The nomads will win their freedom, and the adventurers will win a sizeable reward if they can make the planet unprofitable for the corporation by destroying outposts, stores, roads, and vehicles, ambushing convoys, freeing captives, and eluding the large corporate paramilitary security forces sent to catch them.

ARABIAN KNIGHTS

The adventurers (or mercenary unit) are hired to escort a caravan of great importance across desert territory inhabited by tribes of wild and bloodthirsty nomad barbarians. With the caravan is the daughter of an important city ruler, on her way to wed the ruler of a neighboring state to form an alliance important to off-world corporate interests. To have her killed or captured might bring on war and the loss of trade agreements with the very independent local rulers — and might even result in the adventurers being stranded.

VERY FOREIGN LEGION

The adventurers (or mercenary unit) have been hired by an off-planet corporation to protect a corporate mining community from desert raiders who have declared a holy war against the alien desecrators of sacred lands. The community is protected behind adobe walls erected for defense, but there are a very great many of the nomads, and if they get over the walls, there will be a massacre. One variant of this adventure would be to have the adventurers 'volunteered' to sneak over the walls at night, slip past the surrounding nomad encampments, and cross the desert to the corporation-maintained starport some hundreds of kilometers distant in order to bring help (loss of radios and a misunderstanding of reports could have suggested to the starport that the community was already destroyed).

Many other adventures will suggest themselves, including military operations, rescue and salvage, exploration or surveys, and hunting. In particular, military operations in the desert have fascinated leaders since long before Rommel — or even Scipio Africanus. Almost any earthlike planet can be expected to have at least some arid environments where adventures such as these can take place.

Duneraiders is a **Traveller** adventure from Gamelords set in the desert. This booklet, **The Desert Environment**, provides the information necessary to extract the greatest realism and excitement from that adventure.

FINAL NOTES

This booklet touches upon only a few of the possibilities for desert adventuring. Referees are encouraged to use the material presented in **The Desert Environment** in any way which enhances their own **Traveller** games and campaigns.

The rules and information in **The Desert Environment** are representative rather than definitive, and should be used, changed, or disregarded, in the best interests of smooth, fast, and excitiong **Traveller** action.

ENVIRONMENTS FOR ADVENTURE

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